RADIO SET
AN/GRC-9

TÉLÉCOMMUNICATIONS RADIOÉLECTRIQUES ET TÉLÉPHONIQUES
PARIS (FRANCE)

RADIO SET
AN/GRC-9

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WARNING

HIGH VOLTAGE

is used in the operation of
this equipment.

A DANGEROUS SHOCK

may result if operating personnel
fail to observe safety precautions.

First Aid for Electric Shock

RESCUE.

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

SYMPTOMS.

a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

TREATMENT.

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only*, remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth-to-mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such manner that:

(*1*) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;

(*2*) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;

(*3*) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;

(*4*) the operator's elbows are straight and locked.

f. The resuscitation procedure is as follows:

(*1*) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(*2*) Swing back, suddenly releasing pressure, and sit on the heels.

(*3*) After 2 seconds rest, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4

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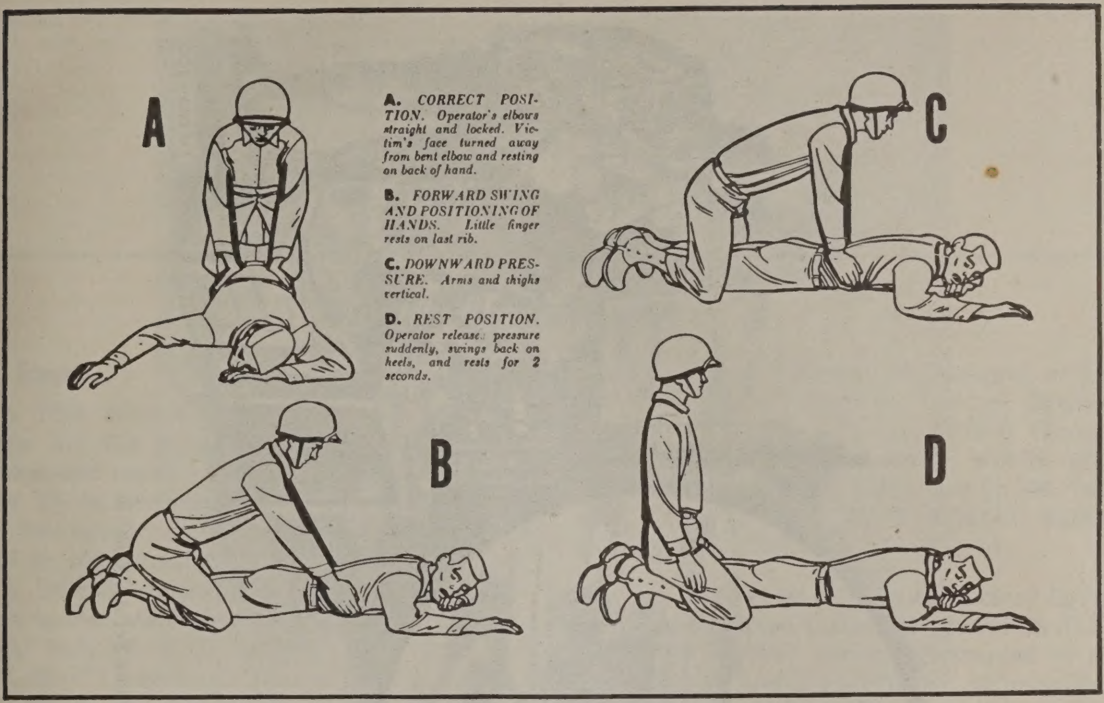
First aid notice



A. *CORRECT POSITION. Operator's elbows straight and locked. Victim's face turned away from bent elbow and resting on back of hand.*

B. *FORWARD SWING AND POSITIONING OF HANDS. Little finger rests on last rib.*

C. *DOWNWARD PRESSURE. Arms and thighs vertical.*

D. *REST POSITION. Operator releases pressure suddenly, swings back on heels, and rests for 2 seconds.*

seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

RELIEVING OPERATOR.

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

STIMULANTS.

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostril for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

CAUTIONS.

a. After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

b. Keep the victim lying flat on his back, with his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

c. A resuscitated victim must be watched carefully as he may suddenly stop breathing. *Never leave a resuscitated person alone until it is CERTAIN that he is fully conscious and breathing normally.*

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First aid notice—Continued

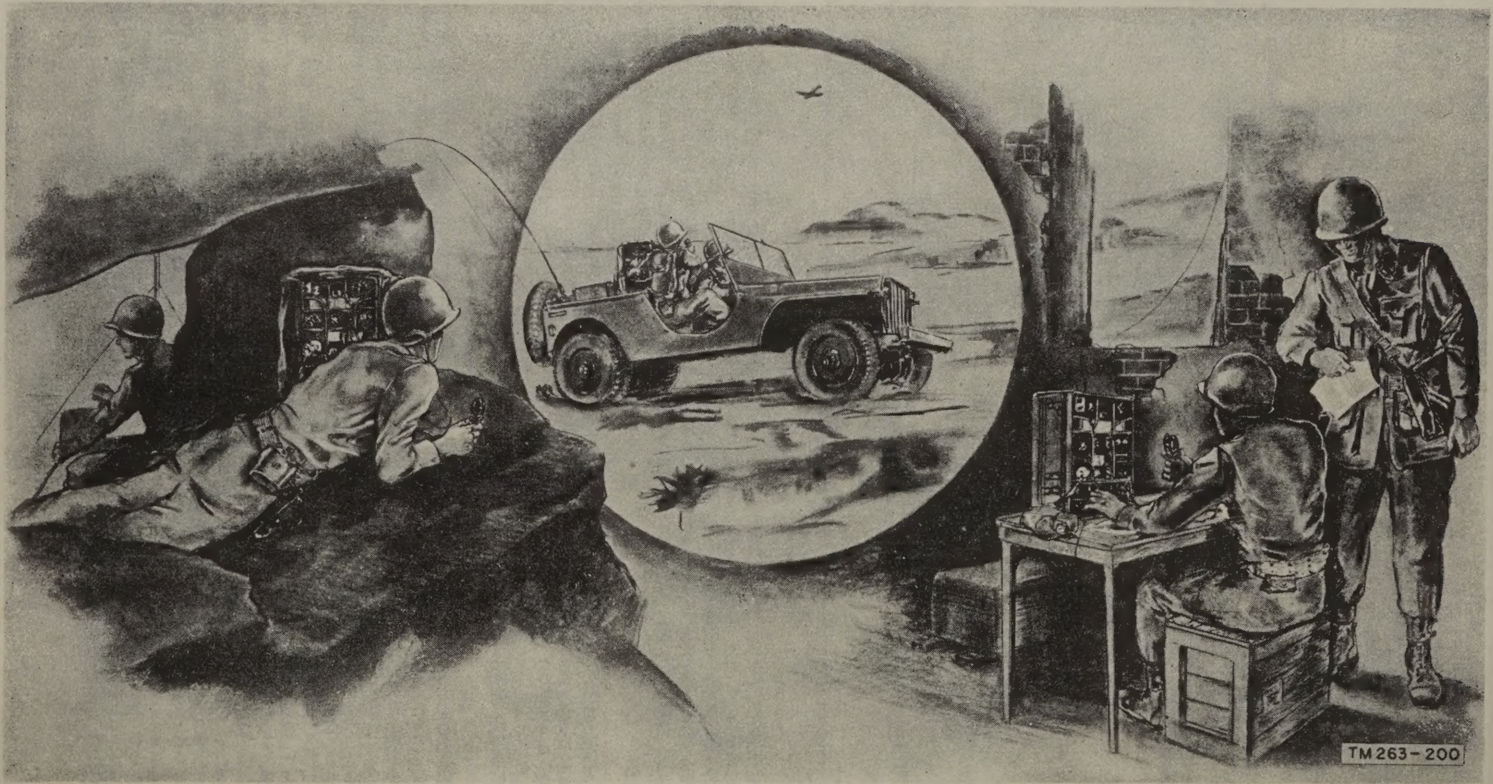

Figure 1. Typical installations for Radio Set AN/GRC-9.

CHAPTER I

INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains instructions for the installation, operation, maintenance, and repair of Radio Set AN/GRC–9(*) (fig. 1). In addition to these instructions there are two appendixes covering a list of references and an identification table of parts.

b. Official nomenclature followed by (*) is used to indicate all models of the item of equipment included in this manual. Thus Generator GN–58–(*) represents Generators GN–58 and GN–58–A.

2. Forms and Records

The following standard forms will pe used for reporting unsatisfactory conditions of matériel and equipment, or improper preservation, packaging, packing, marking, loading, stowage, or handling thereof.

a. DD Form 6, Report of Damaged or Improper Shipment (Reports Control Symbols CS GLD–66 (Army), S and A–70–6 (Navy), and AF–MC–U2 (Air Force)), will be filled out and forwarded as prescribed in SR 745–45–5 (Army), NAV DEPT SERIAL 85POO (Navy), and AFR 71–4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report (Reports Control Symbol CS GLD–247), will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700–45–5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Radio Set AN/GRC–9 (fig. 1 is a combined radio transmitter and radio receiver which provides telephone, c-w (continuous-wave), and mcw (modulated continuous wave) communication as a portable field set (fig 1). It also may be installed on a vehicle.

b. The equipment consists of Receiver-Transmitter RT–77/GRC–9 which can be either crystal- or master-oscillator controlled; it transmits phone, c-w, or mcw signals from 2 mc (megacycles) to 12 mc. All modulation is a-m. (amplitude-modulation). Transmitter-Receiver RT–77/GRC–9 receives c-w, mcw, and phone signals in the same frequency range. Generator GN–58–(*), a hand-operated generator capable of supplying all the required power for operation of the set, is supplied. Vibrator Power Unit PE–237 which supplies all the power necessary to operate the set from a vehicular battery is included also. A number of additional components are listed in paragraph 7 (fig. 2). The operating equipment set up for normal field use is shown in figure 35.

4. System Application

a. Radio Set AN/GRC–9 is used to communicate with any a-m equipment that operates within the 2-mc to 12-mc band. It can be used as an isolated unit or in a net group. Under favorable conditions, Radio Set AN/GRC–9 will provide communication between moving vehicles of

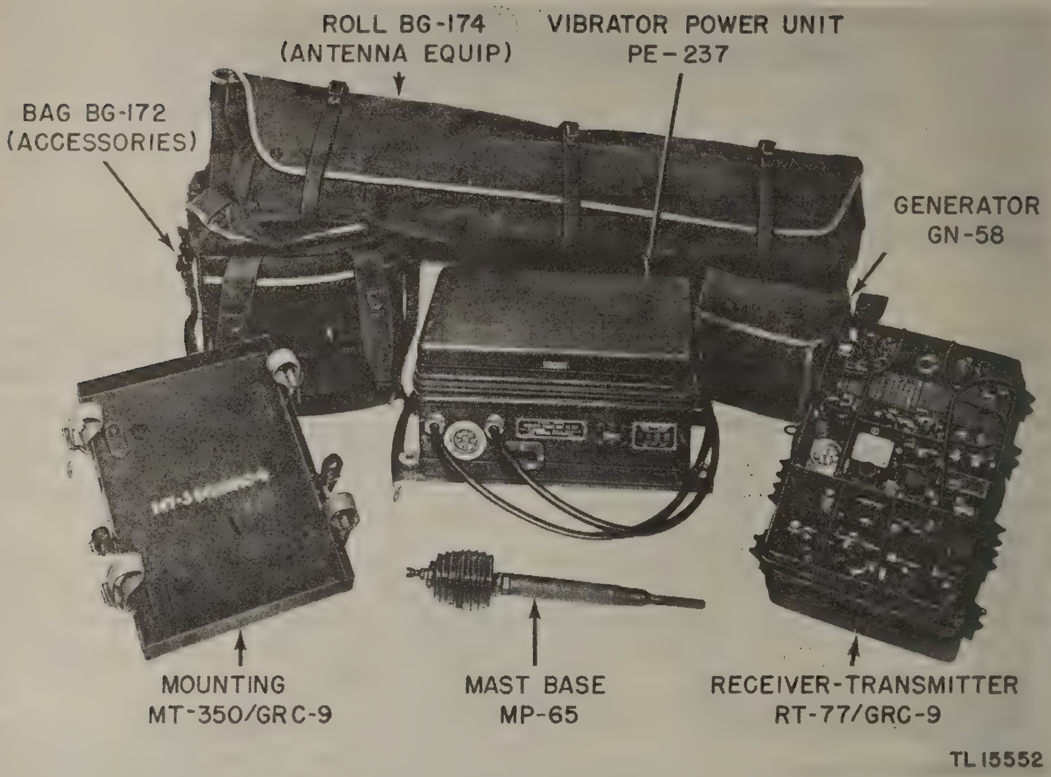
ROLL BG-174
(ANTENNA EQUIP)
VIBRATOR POWER UNIT
PE-237
BAG BG-172
(ACCESSORIES)
GENERATOR
GN-58
MOUNTING
MT-350/GRC-9
MAST BASE
MP-65
RECEIVER-TRANSMITTER
RT-77/GRC-9
TL15552

Figure 2. Radio set AN/GRC-9, operating components.

up to 15 miles on voice and up to 30 miles on c-w.

b. A simplified block diagram is shown in figure 3. Both the transmitter and the receiver use the same antenna. A relay, located in the transmitter cabinet and actuated by the transmitter key, switches the antenna to the transmitter unit when the key is depressed. When the key is not depressed, the antenna remains connected to the receiver, whereas the transmitter is made inoperative by other contacts of the same relay.

c. The receiver may be used with either high- or low-impedance headphones or Loudspeaker LS–7. Loudspeaker LS–11 (not supplied) also may be used. The receiver can be operated with power supplied from Vibrator Power Unit PE–237, Generator GN–58–(*), or Battery BA–48.

d. The transmitter section generates a continuous r-f (radio-frequency) carrier and provides means for keying or voice modulation. Power is supplied to the transmitter by either Vibrator Power Unit PE–237 or Generator GN–58–(*). Battery BA–48 is not used to operate the transmitter. Gasoline engine-driven Power Supply PE–162 also may be used.

e. Vibrator Power Unit PE–237 supplies all power to Receiver-Transmitter RT–77/GRC–9 from a 6-, 12-, or 24-volt d-c (direct-current) vehicular storage battery supply.

f. When a source of current supply is not available, Receiver-Transmitter RT–77/GRC–9 may be operated by using Generator GN–58–(*) which is hand operated.

g. Only the receiver may be used for stand-by operation, using Signal Corps Battery BA–48 (not supplied).

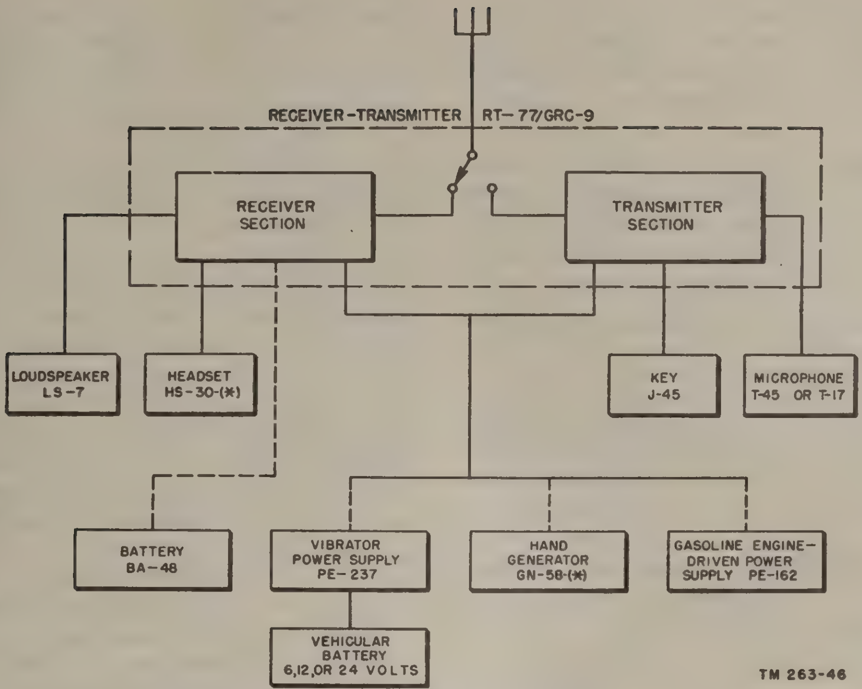
RECEIVER-TRANSMITTER RT-77/GRC-9
RECEIVER SECTION
TRANSMITTER SECTION
LOUDSPEAKER LS-7
HEADSET HS-30-(*)
KEY J-45
MICROPHONE T-45 OR T-17
BATTERY BA-48
VIBRATOR POWER SUPPLY PE-237
HAND GENERATOR GN-58-(*)
GASOLINE ENGINE-DRIVEN POWER SUPPLY PE-162
VEHICULAR BATTERY 6,12,OR 24 VOLTS
TM 263-46

Figure 3. Radio set AN/GRC-9, simplified block diagram.

5. Technical Characteristics

a. TRANSMITTER SECTION OF RECEIVER-TRANSMITTER RT-77/GRC-9.

Frequency range:	
Three bands covering	2.0 mc to 12 mc.
Band 1	6.6 mc to 12 mc.
Band 2	3.6 mc to 6.6 mc.
Band 3	2.0 mc to 3.6 mc.
Transmitter type	Crystal or master oscillator p-a (power-amplifier).
Crystal channels	Two in each band (crystals not supplied).
Types of signals transmitted	C-w, mcw, and phone.
Distance range:*	
C-w:	
Stationary	75 miles.
Moving	30 miles.
Voice:	
Stationary	25 miles.
Moving	15 miles.
Type of modulation	Amplitude.
Number of tubes	5.
Power input to Vibrator Power Unit PE-237 with transmitter operating:	
6-volt, high-power position	27 amperes.
6-volt, low-power position	24 amperes.
12-volt, high-power position	13.2 amperes.
12-volt, low-power position	11 amperes.
24-volt, high-power position	7 amperes.
24-volt, low-power position	6.2 amperes.

Power output:**

Power switch Ⓓ position	Vibrator Power Unit PE-237		Generator GN-58-(*)	
	Phone	CW	Phone	CW
High	7 watts	15 watts	3.6 watts	10 watts.
Low	1 watt	5 watts	1.2 watts	5 watts.

**These values are only approximate and will vary with frequency.

Antennas:	
Whip	15 feet long. Consists of three mast sections MS-116-A, one MS-117-A, and one MS-118-A.

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*These values are approximations, since the range will vary considerably according to terrain, atmospheric conditions, frequencies, and time of year, month, and day.

Long-wire	244.5 feet long. (The 137-foot length has calibration chart attached; 107.5 feet of the 244.5-foot length is detachable.)
Power supply	6-, 12-, or 24-volt vehicular battery through Vibrator Power Unit PE–237 or hand Generator GN–58–(*).
Weight	29 pounds, less case.

b. RECEIVER SECTION OF RECEIVER-TRANSMITTER RT–77/GRC–9.

Frequency range:

Band 1	6.6 mc to 12 mc.
Band 2	3.6 mc to 6.6 mc.
Band 3	2.0 mc to 3.6 mc.

Receiver type	Superheterodyne.
Types of signals which can be received	C-w, mcw, and phone.
Number of tubes	7.
Intermediate frequency	456 kc (kilocycles).
Method of calibration	Built-in crystal oscillator.
Calibration points	200-kc intervals.

Power input at STANDBY position using the stand-by section of Vibrator Power Unit PE–237:

6-volt battery	1.25 amperes.
12-volt battery	.8 ampere.
24-volt battery	.6 ampere.

Power supply	6-, 12-, or 24-volt vehicular battery operating Vibrator Power Unit PE–237; Generator GN–58–(*) and Battery BA–48 in a field installation.

Power required by receiver:

A-power	1.4 volts at .45 ampere (maximum).
B-power	105 volts at .02 ampere (maximum).

Antenna	Uses same antenna as transmitter.
Weight	8 pounds, less case.

c. VIBRATOR POWER UNIT PE–237.

Supply requirements	6-, 12-, or 24-volt vehicular battery.
Basic circuit	Two separate vibrator power supplies utilizing full-wave rectification.

(1) *Full-load output of Vibrator Power Unit PE–237.*

Heavy duty section	Early models	Late models
Transmitter plate	475 v at 90 ma	580 v at 100 ma.
Transmitter filaments	6.5 v at 2 amp	6.6 v at 2 amp.
Receiver plates	105 v at 42 ma	120 v at 45 ma.
Receiver filaments	1.35 v at 450 ma	1.5 v at 500 ma.
Keying relay	6.0 v at 500 ma	6.9 v at 575 ma.

Stand-by section	Early models	Late models
Receiver plates	100 v at 17 ma	110 v at 18.5 ma
Receiver filaments	1.35 v at 450 ma	1.6 v at 500 ma.

(2) *Full-load input of Vibrator Power Unit PE–237 with transmitter operating.*[1]

6-volt, high-power position	27 amperes.
6-volt, low-power position	24 amperes.
12-volt, high-power position	13.2 amperes.
12-volt, low-power position	11 amperes.
24-volt, high-power position	7 amperes.
24-volt, low-power position	6.2 amperes.

Tube complement	One tube type 1006 mercury-vapor full-wave rectifier. One tube type 1005 mercury-vapor full-wave rectifier.
Weight	88 pounds.

Note. The above values are only approximate and will vary with changes in input voltage.

d. GENERATOR GN–58–(*).

Supply requirements	Hand operated.
Basic circuit	Regulated and filtered dynamo having both an h-v

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[1] These values are approximate and will vary with change in crank speed.

	and l-v winding on one armature.
Full-load output	Transmitter plate, 425 volts at 115 ma (milliamperes). Receiver plate, 105 volts at 32ma. Transmitter filament, 6.3 volts at 2.5 amperes. Receiver filament, 1.4 volts at 465 ma.
Weight	29 pounds.

6. Packaging Data

a. PACKING DATA (LATE MODELS). When packaged for export shipment, the components of Radio Set AN/GRC–9 are placed in moisture-vaporproof containers and packed in three wooden export boxes. The method of packing a typical component for export is shown in figure 29. The size, weight, contents, and volume of each crate are given in the following charts for the late models of Radio Set AN/GRC–9.

Note. Items may be packaged in a manner different from that shown, depending on the supply channel. See the packing list in each crate for the exact contents.

Box No.	Contents	Dimensions (in.)			Weight (lb)	Volume (cu ft)
		Length	Width	Depth		
1	Receiver-Transmitter RT–77/GRC–9 Panel Cover CW–109/GRC–9. Cord CD–1119. Bag CW–140/GRC–9.	25	15½	16⅝	79	3.7
2	Bag BG–172 and contents Equipment literature. Roll BG–174 and contents. Generator GN–58. Bag BG–175. Mast Base MP–65. Mounting MT–350/GRC–9.	47¾	21	12⅝	142	7.6
3	Vibrator Power Unit PE–237 Cord CD–1086.	26⅝	19½	14⅞	138	4.6

b. PACKAGING DATA (EARLY MODELS). The early models of Radio Set AN/GRC–9 also are packed for export in three wooden boxes. A packing slip in a moistureproof inclosure is stapled to box No. 1 and lists the contents for each of the three boxes. The items contained in the boxes are shown in the table below.

Note. Items may be packaged in a different manner from that shown, depending on supply channels.

Box No.	Contents	Dimensions (in.)			Weight (lb)	Volume (cu ft)
		Length	Width	Depth		
1	Receiver-Transmitter RT–77/GRC–9 Panel Cover CW–109/GRC–9. Cord CD–1119.	25	15½	16⅝	79	3.7
2	Bag BG–172 and contents Roll BG–174 and contents. Mast Base MP–65. Mounting MT–350/GRC–9. Generator GN–58, in Bag BG–175.	47¾	21	12⅝	142	7.6
3	Vibrator Power Unit PE–237 Cord CD–1086 (44 in.).	26⅝	19½	14⅞	138	4.6

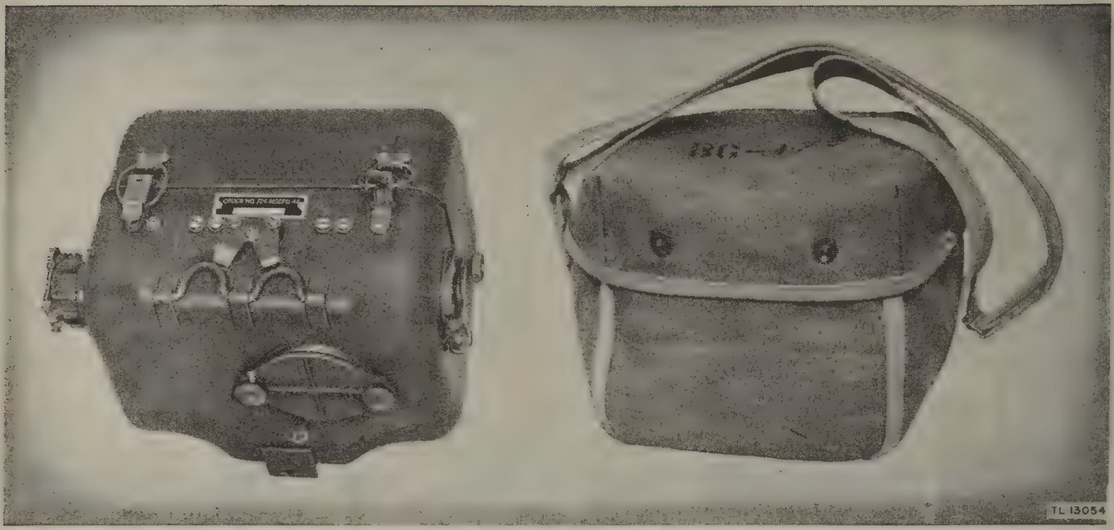


Figure 4. Generator GN–58–(*) and Bag BG–175.

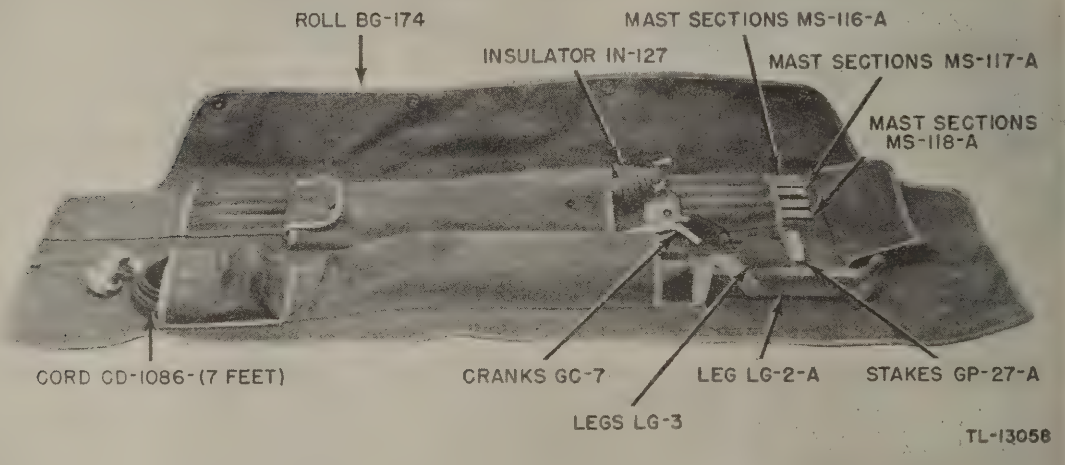

ROLL BG-174
MAST SECTIONS MS-116-A
INSULATOR IN-127
MAST SECTIONS MS-117-A
MAST SECTIONS MS-118-A
CORD CD-1086-(7 FEET)
CRANKS GC-7
LEG LG-2-A
STAKES GP-27-A
LEGS LG-3
TL-13058

Figure 5. Roll BG–174, with contents.

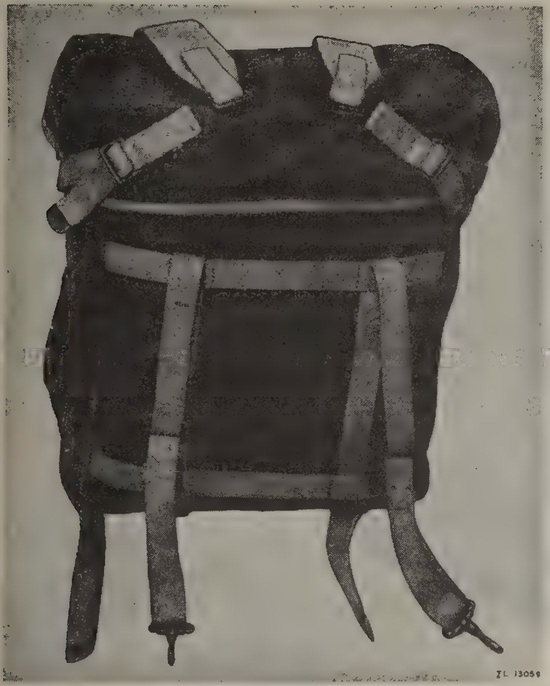


Figure 6. Bag BG–172, packed.

c. CARRYING BAGS (figs 4, 5, 6, and 7). Four carrying bags are provided for transporting the equipment in the field when using the hand generator as the source of supply. The carrying bags are constructed of heavy canvas and are provided with straps to facilitate carrying. The contents of the carrying bags are listed in the following charts:

(1)

Signal Corps stock No.	*Quantity*	*Description*
2Z553–140	1	Bag CW–140/GRC–9 containing–
3E1999–119	1	Cord CD–1119
2Z3350–109	1	Panel Cover CW–109/GRC–9
2C5130–77	1	Receiver-Transmitter RT–77/GRC–9 containing–
2JOC3/VR105	1	Tube type OC3/VR–105
2J1S5	1	Tube type 1S5
2J1L4	2	Tube type 1L4
2J1R5	3	Tube type 1R5
2J2E22	1	Tube type 2E22
2J3A4	3	Tube type 3A4
2J3Q4	1	Tube type 3Q4
2X105–200	1	Crystal Unit CR–23/U
2Z5971.1	2	Lamp, Mazda #49
2Z5889–15	1	Lamp, neon, Mazda #NE–47
3E7173–22	1	Cable assembly, power, p/o Receiver-Transmitter RT–77/GRC–9

(2)

Signal Corps stock No.	*Quantity*	*Description*
3H160–175	1	Bag BG–175 containing–
3H2358	1	Generator GN–58–A containing–
3H525–97	2	Brush, carbon, H.V.
3H525–99	2	Brush, carbon, L.V.

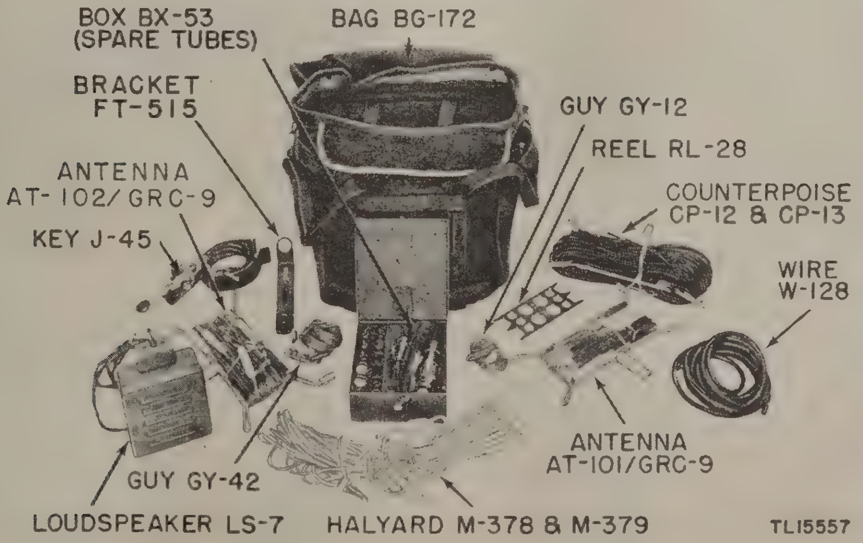

BOX BX-53
(SPARE TUBES)
BAG BG-172
BRACKET
FT-515
GUY GY-12
REEL RL-28
ANTENNA
AT-102/GRC-9
COUNTERPOISE
CP-12 & CP-13
KEY J-45
WIRE
W-128
ANTENNA
AT-101/GRC-9
GUY GY-42
LOUDSPEAKER LS-7
HALYARD M-378 & M-379
TL15557

Figure 7. Bag BG–172, contents.

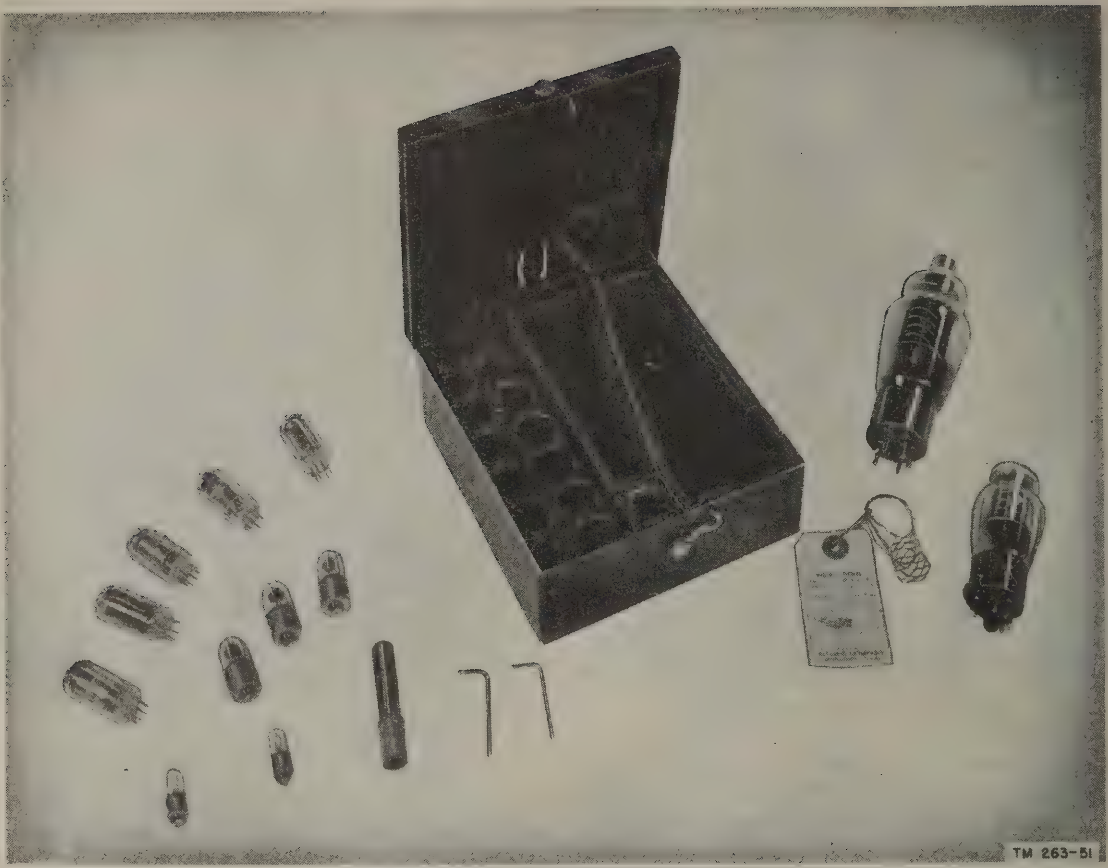


Figure 8. Box BX-53-C and contents.

(3)

Signal Corps stock No.	*Quantity*	*Description*
28060–174	1	Roll BG–174 containing–
2Z2416	6	Mast Section MS–116–A
2A2417	2	Mast Section MS–117–A
2A2418	2	Mast Section MS–118–A
2A3327	4	Stake GP–27–A
2Z6102B	1	Leg LG–2–B
2Z6103B	2	Leg LG–3–B
3E1999–86	1	Cord CD–1086 (7 ft)
3G627	1	Insulator IN–127
3H1407	2	Crank, hand; Crank GC–7

(4)

Signal Corps stock No.	*Quantity*	*Description*
2Z551–172	1	Bag BG–172 containing–
1B128	1	Wire W–128 (10 ft)
2A1312	1	Guy GY–12
2A1336–42	1	Guy GY–42
2A203–101	1	Antenna AT–101/GRC–9
2A203–102	1	Antenna AT–102/GRC–9
2A3128	1	Reel RL–28
2A3129	3	Reel RL–29
2A712	1	Counterpoise CP–12
2A713	1	Counterpoise CP–13
2Z1203–515	1	Bracket FT–515
2Z6310–7	1	Loudspeaker LS–7
3Z3445	1	Key J–45
6Z4938	1	Halyard M–378
6Z4939	1	Halyard M–379

(5)

Signal Corps stock No.	*Quantity*	*Description*
6F153C	1	Box BX–53–C containing–
2JOC3/VR105	1	Tube type OC3/VR105
2J1S5	1	Tube type 1S5
2J1L4	1	Tube type 1L4
2J1R5	1	Tube type 1R5
2J2E22	1	Tube type 2E22
2J3A4	1	Tube type 3A4
2J3Q4	1	Tube type 3Q4
2Z5971.1	2	Lamp, pilot, Mazda #49
6R7443–4	1	Puller, tube, Kellems #11–16

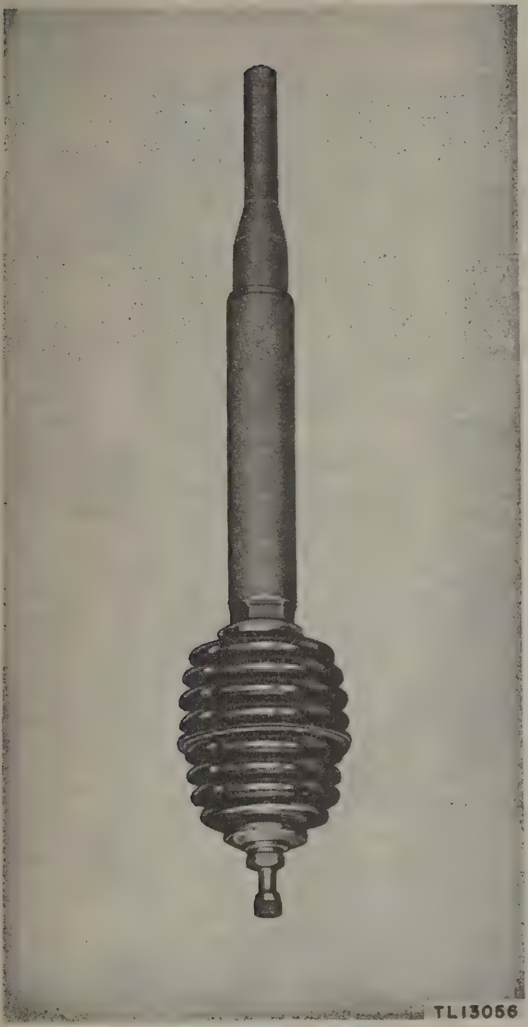


Figure 9. Mast base MP–65–A.

Signal Corps stock No.	*Quantity*	*Description*
2Z5889–15	3	Lamp, neon, Mazda #NE–47
6R55230	1	Wrench, Bristo #6
6R55231.1	1	Wrench, Bristo #8
6Q36920–2	1	Puller, pilot lamp

d. ADDITIONAL COMPONENTS. Additional components not supplied in canvas bags are as follows:

Signal Corps stock No.	*Quantity*	*Description*
2A2088–65	1	Mast Base MP–65–A
2Z6763–350	1	Mounting MT–350/GRC–9 containing–
6L80026	1	Bag of hardware consisting of–
6L3608–32.3	18	Nut, hex; steel, #8–32
6L6332–16.495	18	Screw, machine; steel #8–32
6L72208C	18	Washer, lock; steel, #8

e. CONTENTS OF ONE OF THE PACKING CRATES.

(1)

Signal Corps stock No.	*Quantity*	*Description*
3E1999–86–3.8	1	Cord CD–1086, 44" long
6L80021	1	Kit of hardware containing–
6L3506–24–10Z	6	Nut, hex, ⅜"–24
6L4906–40.24	6	Screw, cap, ⅜"–24x2½"
6L7220–32	10	Washer, lock, ⅜"
6Z3147	2	Connector, Appleton #61077

(2)

Signal Corps stock No.	*Quantity*	*Description*
3H6800–237	1	Vibrator Power Unit PE–237 containing–
2J1005	2	Tube type 1005
2J1006	2	Tube type 1006
3H6694–11	2	Vibrator VB–16
3H6707	2	Vibrator, Oak #V6460–17XS
6R57400	1	Wrench, set screw, Allen #8

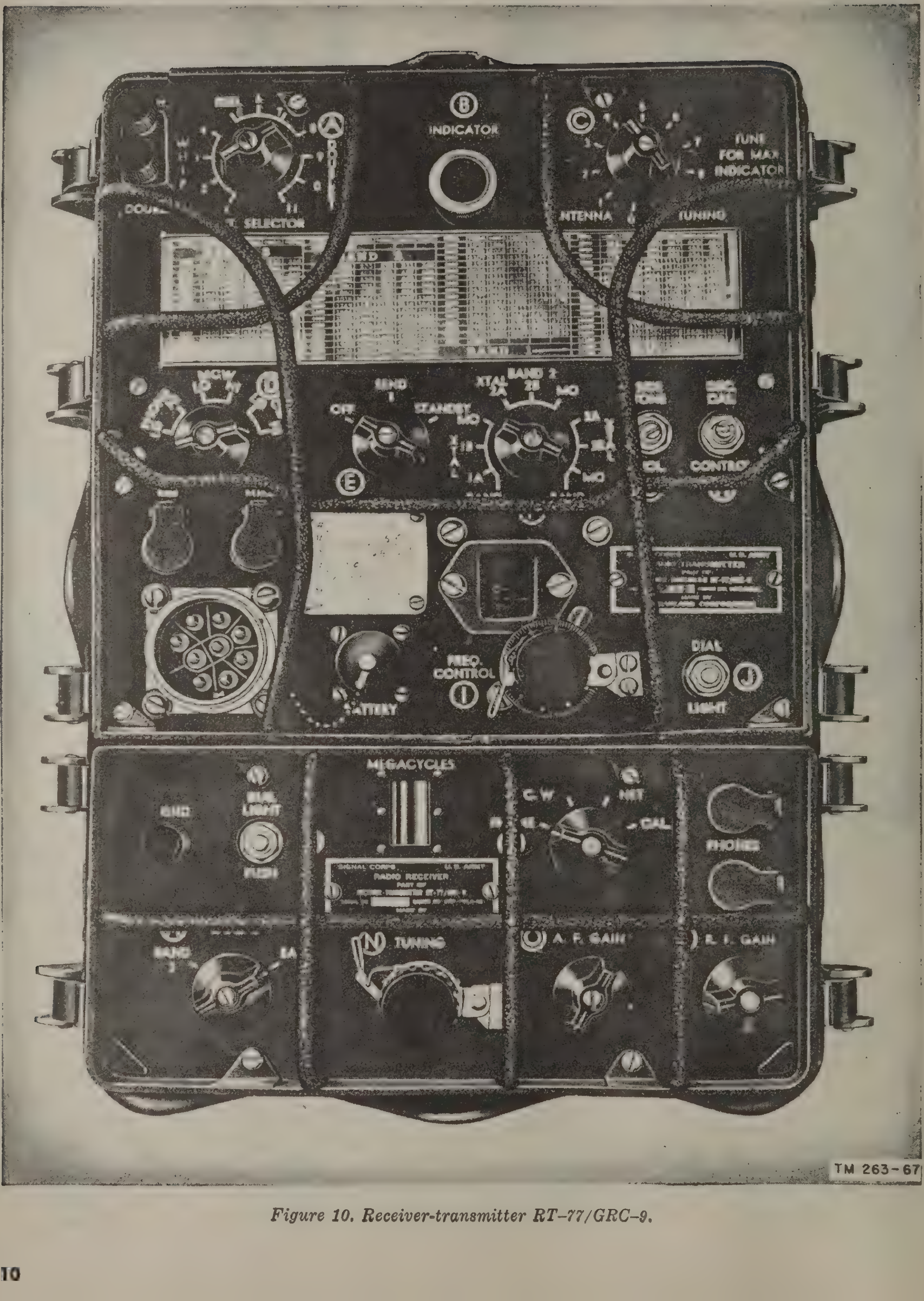

B
INDICATOR
C
TUNE
FOR MAX
INDICATOR
SELECTOR
TUNING
MCW
SEND
OFF
STANDBY
XTAL
BAND 2
2A
2B
MO
E
CONTROL
FREQ.
CONTROL
BATTERY
DIAL
J
LIGHT
MEGACYCLES
SIGNAL CORPS
U.S. ARMY
RADIO RECEIVER
GND
DIAL
LIGHT
PUSH
C-W
NET
CAL
PHONES
BAND
N
TUNING
A. F. GAIN
R. F. GAIN
TM 263-67

Figure 10. Receiver-transmitter RT–77/GRC–9.

7. Table of Components

Component	Required No.	Length (in.)	Width (in.)	Depth (in.)	Weight (lb)
Antenna AT–101/GRC–9 } Wound on Reel	1	12	8½	2	2¼
Antenna AT–102/GRC–9 } RL–29	1	12	8½	2	2½
Bag BG–172 (for equipment accessories)	1	13	13	10	25
Bag CW–140/GRC–9 (Receiver-Transmitter RT–77/GRC–9).	1	16½	12½	15	2
Bag BG–175 (Generator GN–58)	1	10	8	10½	2
Box BX–53 (spare tubes, lamps, and pilot lights)	1	6½	6	2½	1½
Cord CD–1086 (7 ft long for connecting receiver-transmitter to generator).	1	84			2¼
Cord CD–1086 (44 in. long for connecting receiver-transmitter to Vibrator Power Unit PE–237).	1	44			1¾
Cord CD–1119 (BA–48 to receiver-transmitter)	1	34½			¼
Counterpoise CP–12 } on Reel	1	12	8½	3½	3¾
Counterpoise CP–13 } RL–29					
Cranks GC–7	2	7½	5½	1	½
Generator GN–58–(*)	1	10½	7½	8	22¾
Guy GY–12	1	2½	2½	¾	⅛
Guy GY–42	1	3	1½	1½	¼
Halyard M–378	1	14	1½	1½	1½
Halyard M–379	1	10	1	1	¼
Insulator IN–127	1	14½	3	3	1⅛
Key J–45	1	5½	4¼	2	1
Leg LG–2–B	1	33¾	6	2½	4
Leg LG–3–B	2	24	3½	1½	½
Loudspeaker LS–7	1	7	4¾	3	3
Mast Base MP–65–A	1	17½	3¼	3¼	3
Mast Section MS–116–A	6	39½			¼
Mast Section MS–117–A	2	39½			⅛
Mast Section MS–118–A	2	39½			1/16
Mounting MT–350/GRC–9 (with 1 bag hardware)	1	16¾	11¾	1¾	4½
Bracket FT–515	1	7	1¼	1¼	⅛
Receiver-Transmitter RT–77/GRC–9 (complete)	1	16	13	8	32
Reel RL–28 (guys)	1	6½	2¾	1/16	¼
Reel RL–29	3	12	8½	1	½
Roll BG–174 (antenna sections)	1	42	10	4½	22
Stake GP–27–B	4	7½			⅛
Technical Manual TM 11–263	2				
Wire W–128	10 ft				½
Vibrator Power Unit PE–237	1	20	10½	10¾	74
Hardware for Vibrator Power Unit PE–237	1 bag				
Total weight (lb)					215 11/16

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

8. Assembly Description of Receiver-Transmitter RT–77/GRC–9

a. The receiver-transmitter (fig. 10) consists of a complete seperate receiver unit and a complete individual transmitter unit. The units are mounted in a metal case having a tight fitting metal cover which is removed for operation of the set.

b. This Panel Cover CW-109/GRC–9 has a rubber seal around its edge to prevent water from entering the set. When the cover is installed on the metal case, the entire assembly will float. To remove the cover, pull up gently on the metal clamps arranged along the sides (fig.11).

Caution: Be sure to release the clamps in the manner shown in figure 11. Injury may result if the thumb is struck by the clamp as it is released. Hold the clamp firmly and pull up gently.

c. When the cover is completely removed from the case, the individual receiver and transmitter sections may be lifted partly out of the

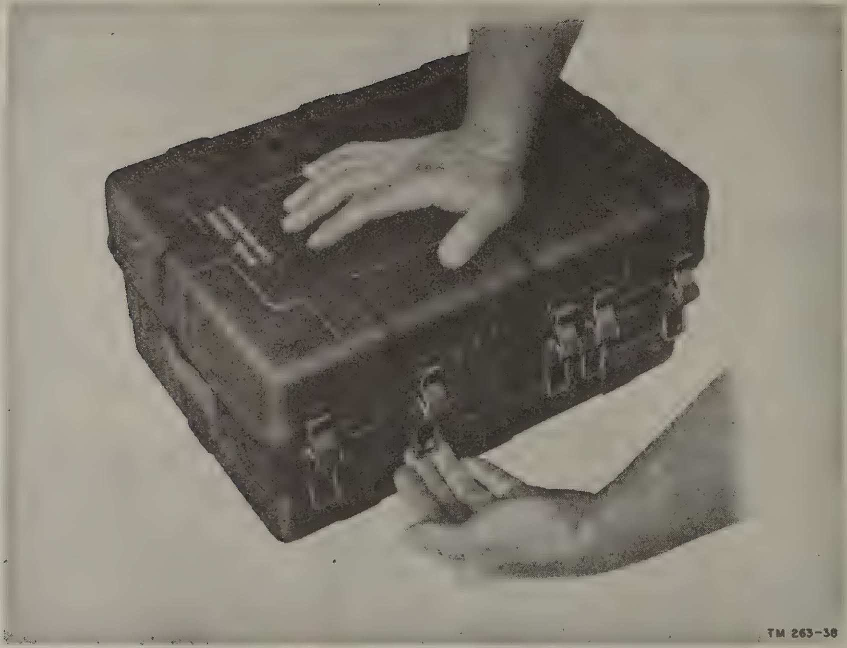


Figure 11. Removing front cover of receiver-transmitter RT–77/GRC–9.

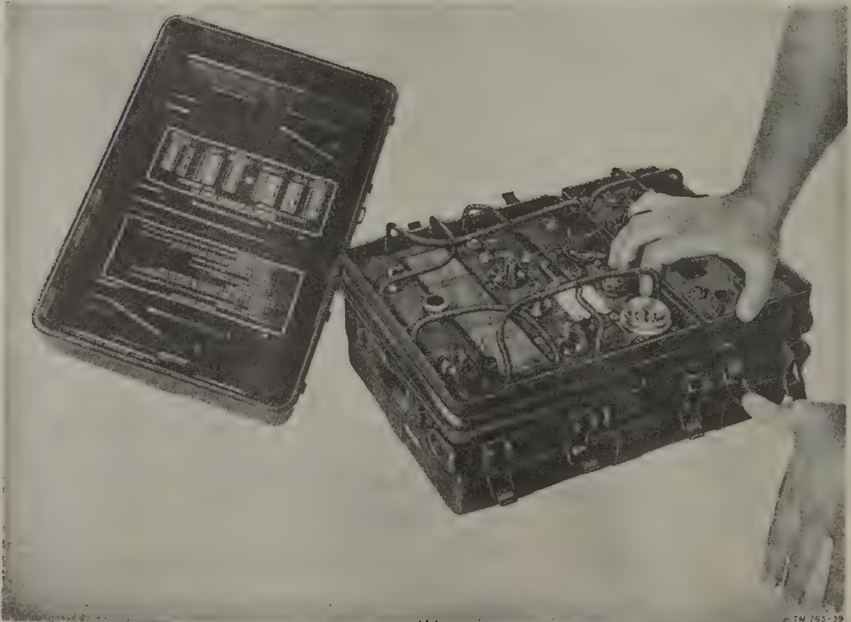


Figure 12. Resetting the clamps on the panels of receiver-transmitter RT–77/GRC–9.

case. To prevent the possibility of these units falling out of the case, reset the clamps on the small projections on the receiver and transmitter front panels (fig. 12). The same precaution must be observed in unhooking the clamps from this position, as when the front cover was on.

d. The individual units are physically and electrically divided into separate sections and are connected together electrically by a separate interconnecting cable (3E7173–22); the two ends plug into individual sockets on the transmitter and the receiver (fig. 39). All jacks and controls, except one, are located on the front panel. The one control in the rear of the receiver is the switch that accommodates the receiver output circuit to the different loudspeaker and headphone impedances (fig. 39).

e. All jacks, controls, and switches are waterproofed for complete protection of the radio set when operating under extremely humid conditions. The entire assembly is mounted in Bag CW–140/GRC–9, which is a canvas bag used to provide additional carrying space when operating or transporting the radio set.

9. Receiver Section of Receiver-Transmitter RT–77/GRC–9

(fig. 13)

a. The receiver is designed to receive a-m signals in the frequency range of 2 mc to 12 mc in three distinct bands.

b. The front panel of the receiver contains the controls necessary for its operation and is protected by an open grillwork. There are two phone jacks allowing two Headsets HS–30 to be used simultaneously. The jacks have covers which are held tightly over the jack openings by springs. These covers protect the jacks from dirt and moisture. In the upper left-hand corner of the panel is the GND. (ground) connecting post for the lead from the counterpoise which is used when a vertical antenna is used. The TUNING knob, control Ⓝ, has a device incorporated on the panel by which it may be locked at any desired dial position. The dial is shown unlocked in figure 13. To lock it, push the metal lever down.

c. Some knobs, such as those on controls Ⓜ, Ⓞ, Ⓟ, have a white line on only one side of their centers. The knob on control Ⓛ, however, has a white line on both sides of its center. Knobs having two white lines indicate that the control can be rotated in either direction continuously without having to stop. Knobs with one white line cannot be turned continuously in one direction, but upon reaching the stop position, they must be rotated back in the opposite direction. A knob with one white line must never be forced beyond the stop position or it will break.

10. Transmitter Section of Receiver-Transmitter RT–77/GRC–9

(fig. 14)

a. On the front panel are located all the controls necessary for the operation of the trans-

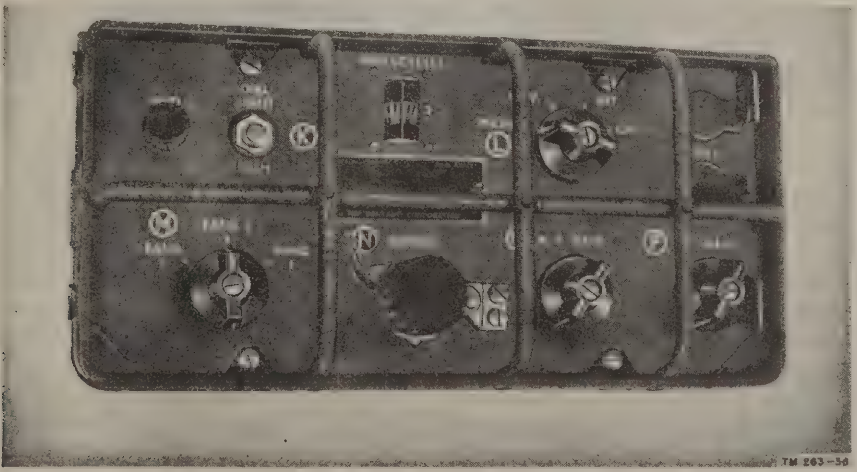
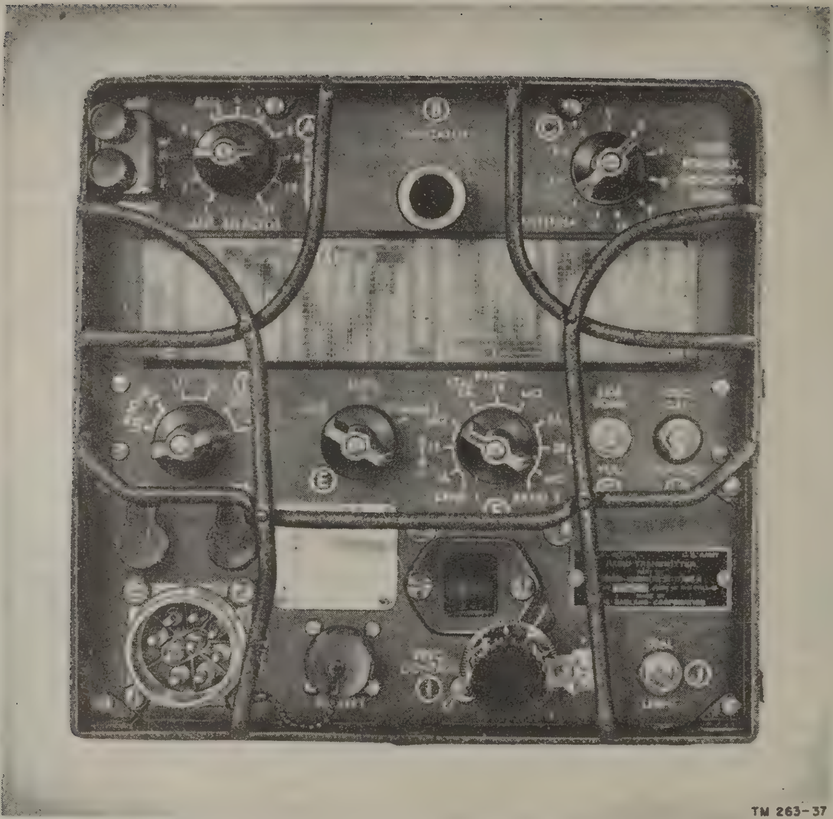


Figure 13. Receiver section of receiver-transmitter RT–77/GRC–9.



TM 263-37

Figure 14. Transmitter section of receiver-transmitter RT–77/GRC–9.

mitter; these controls are protected by an open grillwork. The antenna and doublet lead-ins are attached to the binding posts in the upper left-hand corner. In the lower left-hand corner are two jacks for the insertion of the microphone and the handkey. Small covers are held against the jacks by means of springs in order to keep out dirt and moisture. The d-c power input receptacle for both the transmitter and receiver are in the extreme lower left-hand corner of the transmitter. The receptacle contacts are arranged so that the power cord from either the generator or the vibrator power unit will fit in only one position. This is an assurance that correct voltages will be fed to the proper components. Although the battery supplies power only to the receiver, it is connected by cable to a receptacle on the transmitter panel, which is directly on the right of the power receptacle. There is a small metal key in the battery receptacle which allows the battery cable plug to fit in one position, as is the case with the power receptacle.

b. The frequency control knob Ⓘ on the transmitter may be locked in position in the same manner as the receiver tuning dial. Dial knobs on the transmitter which may be turned continuously in one direction, are those with two white lines (controls Ⓓ and Ⓔ). Controls Ⓐ, Ⓒ, and Ⓕ have stops and must not be forced. When the stop position is reached, the knob must be turned back in the opposite direction. The large chart on the transmitter gives the numbers to which the tuning dials must be turned, in order to transmit the corresponding frequencies on the chart. There is a smaller white chart, marked CRYSTALS, on which should be marked in pencil, the frequency ranges of transmission obtained with the different crystals.

11. Vibrator Power Unit PE–237
(fig. 15)

a. The vibrator power unit (fig. 15) is a vehicular operational component capable of supplying all voltage required for Receiver-Transmitter RT–77/GRC–9. It consists of two independent power supply systems: a heavy duty unit for supplying power to the receiver and transmitter for normal two-way communication, and a small unit for supplying only receiver voltage during long periods of listening. Input voltage to the vibrator unit may be 6, 12, or 24 volts, with the negative (–) grounded. A switch provided inside the cover of this unit allows the operator to change all internal connections simultaneously to correspond with the voltage of the vehicular battery. This switch is marked VOLTAGE CHANGE SWITCH (fig. 117).

b. A window in the side of the case permits observation of a drum on the switch, indicating the voltage for which the switch is set. The ON-OFF switch, in addition to serving as a means of starting and stopping the unit, is a circuit breaker that will open the battery input circuit when an overload is present; it is reset by pressing the ON button. The case of the unit is watertight in case of submersion. The entire unit is supported on four shockmounts through which bolts can be passed to secure it to the vehicle.

c. The vibrator output receptacle is located on the left of the front side of the unit. The contacts of the receptacle are arranged in a definite pattern so that the cable plug which fits into it will be in the correct position. A small metal plate on the right front of the unit marked VOLTAGE CURRENT RATINGS gives the

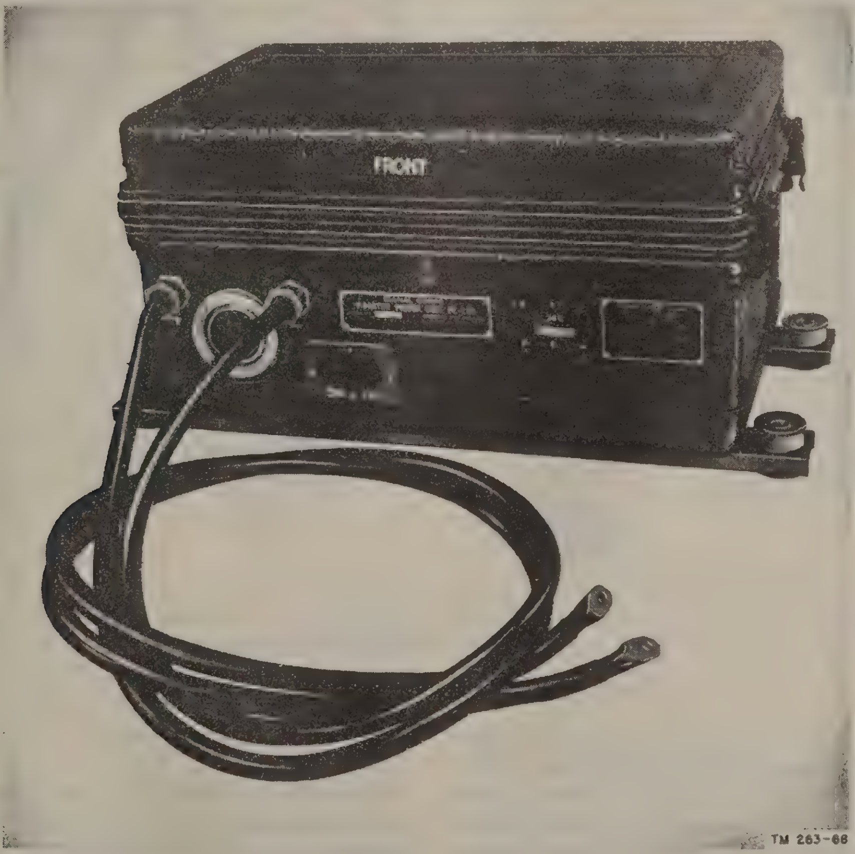


Figure 15. Vibrator power unit PE–237.

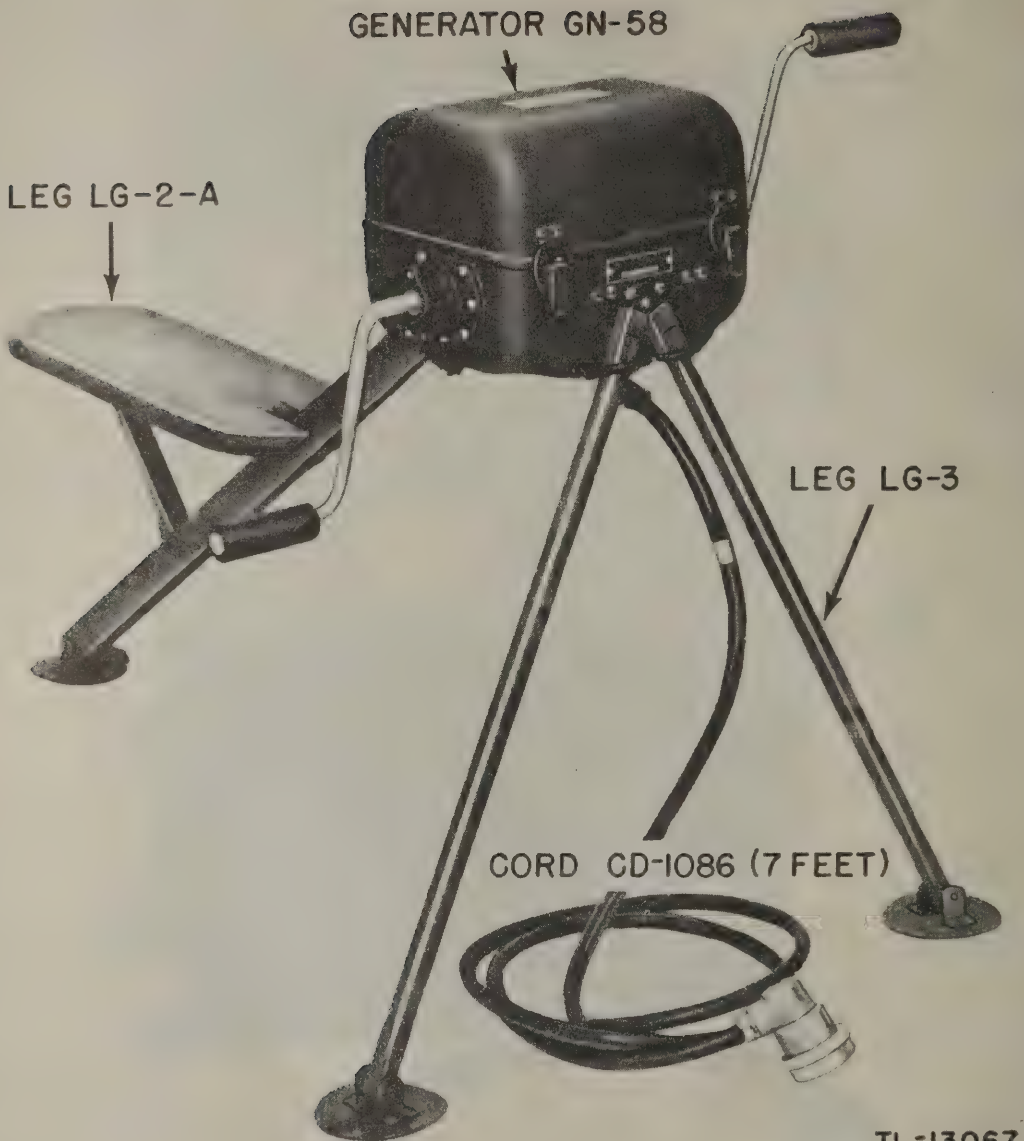

GENERATOR GN-58
LEG LG-2-A
LEG LG-3
CORD CD-1086 (7 FEET)
TL-13067

Figure 16. Generator GN–58, set up for operation.

rated input and output currents and voltages of Vibrator Power Unit PE-237. Two heavy rubber covered cables emerge from outlets marked + and –. These are used to connect the vehicular battery to the vibrator power supply unit.

12. Generator GN–58–(*)
(fig. 16)

Generator GN–58–(*) is a hand-operated unit designed to supply power to Receiver-Transmitter RT–77/GRC–9 when a vehicular battery is not available, as in portable field use.

When using the generator, the transmitter output is not as great as when the vibrator is used (par. 5*a*). The generator stands upright on three removable legs and a folding seat is fastened to one of the legs. Hand cranks are inserted into holes on each side of the unit. A power outlet is located in the bottom of the generator. The complete unit is shown set up in figure 16. An earlier model of Generator GN–58 is shown with the bag in which it is transported in figure 4. The clamps shown along the sides of the generator in this illustration are not to be opened for normal operation but only when repairs or adjustments are necessary. The accessories, such as legs and cranks, are carried in the antenna equipment roll, Roll BG–174.

13. Antenna Components

a. ANTENNA AT–101/GRC–9. Antenna AT–101/GRC–9 is a straight stranded copper wire, 107½ feet long, sectionalized by means of eight ceramic insulators and sets of jumpers. It may be adjusted to any required frequency between the ranges of 4,300 and 12,000 kc by opening and closing these jumpers as indicated on the calibration chart attached (fig. 31).

b. ANTENNA AT–102/GRC–9. Antenna AT–102/GRC–9 is a similar type of antenna which is sectionalized by eight ceramic insulators and eight sets of jumpers. It is added to Antenna AT–101/GRC–9 so that the frequency range can be extended to cover the frequencies between 2,000 and 4,300 kc. Both Antenna AT–101/GRC–9 and Antenna AT–102/GRC–9 are supplied and, when not in use, are stored on Reels RL–29. Halyards M–379 and M–378 are lengths of rope with an insulator at one end. They are used to secure the antenna between such supports as trees, buildings, or fence posts (fig. 32).

c. VERTICAL WHIP ANTENNA. The whip antenna consists of five sections of metal tubing, three Mast Sections MS–116, one Mast Section MS–117, and one Mast Section MS–118. These sections are screwed together to form the whip antenna and can be used as a vehicular antenna or for portable field use. As a vehicular antenna, it is screwed into Mast Base MP–65–A that is installed permanently on the vehicle and requires no further support (fig 49). When used as a portable antenna, it fits into Insulator IN–127 that fastens to Bracket FT–515 which is secured to the case of Receiver-Transmitter RT–77/GRC–9 (fig. 37). The whip antenna is then further supported by the use of one Guy GY–12 and two Guys GY–42 that are secured to the ground by three Stakes GP–27–A. Guys GY–12 and GY–42 are supplied and stored on Reel RL–28. A short length cut from Wire W–128 connects the whip antenna mast to the post marked ANT. (antenna) on the transmitter panel (fig. 35).

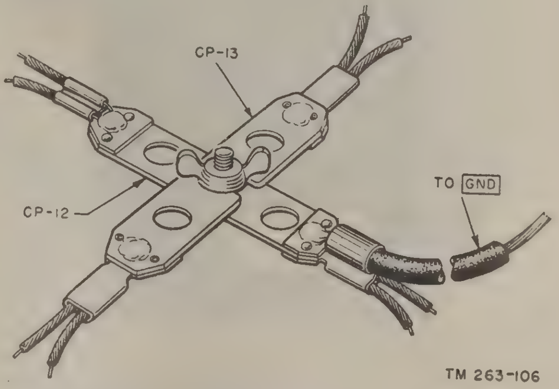


Figure 17. Counterpoises CP–12 and CP–13.

d. COUNTERPOISES CP–12 AND CP–13 (fig. 17). When Receiver-Transmitter RT–77/GRC–9 is used as a portable unit with the whip antenna, Counterpoises CP–12 and CP–13 are fitted together forming a radial network of eight wires and placed on the ground (fig. 35) beneath the whip antenna. They are used to act as a more efficient ground. Counterpoises CP–12 and CP–13 are supplied and stored together on Reel RL–28. They are made up of heavy, flexible, rubber-covered wires. Figure 17 shows the connecting links.

e. MAST BRACKET MP–50 (fig. 18). This is a heavy steel bracket which is used to mount Mast Base MP–65 on the rear of a vehicle (fig. 49).

14. Microphone T–17
(fig. 19)

Microphone T–17 is of the single button, carbon granule type with a self-contained push button which is pressed when it is desired to transmit voice signals. The schematic diagram is shown in figure 20.

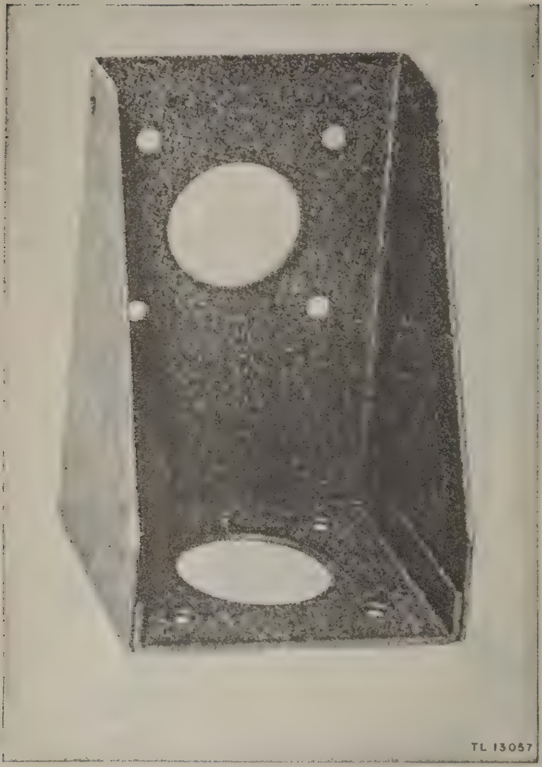


Figure 18. Mast bracket MP–50.

15. Microphone T–45

(figs. 21 and 22)

Microphone T–45 is held in front of the mouth by a harness which can be adjusted for comfort. The plug of Microphone T–45 connects to a corresponding receptacle on Cord CD–318–A. This cord leads to Switch SW–141 which is hung on the chest by means of a strap which fits around the neck. Then the cord emerges from the switch box and terminates in Plug PL–68 which fits into the MIKE jack on the transmitter. Figure 22 shows Microphone T–45 in use.

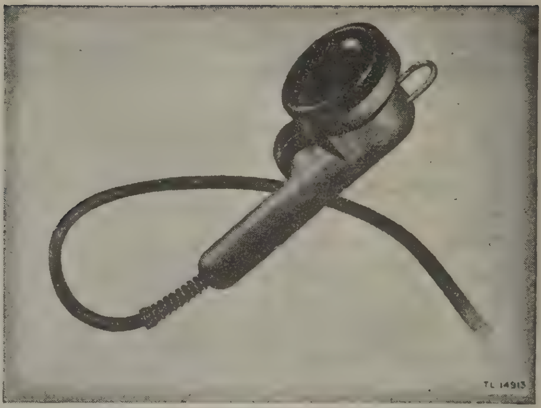


Figure 19. Hand microphone T–17.

16. Key J–45

The key with all the important parts listed is shown in figure 23. The unit is designed to be placed on the operator's leg by means of the metal bands attached. Plug PL–55, which is attached to the end of the cord connected to the key terminals, fits into the jack marked KEY on the transmitter panel.

17. Headset HS–30–(*)

The headset is shown in figure 24. Each earplug can slide partly up and down on the metal headband to adjust to the wearer's comfort. Figure 25 shows the unit in use. The earphones are of the magnetic type.

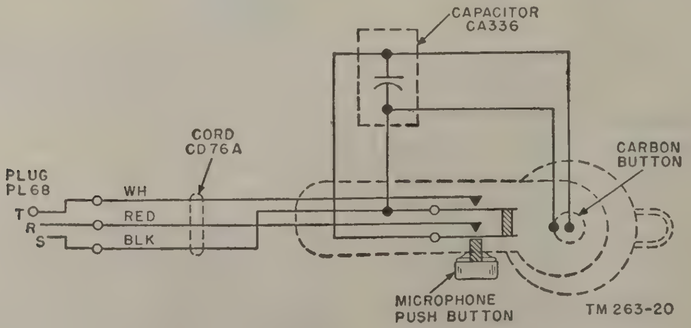


Figure 20. Internal schematic diagram of hand microphone T–17.

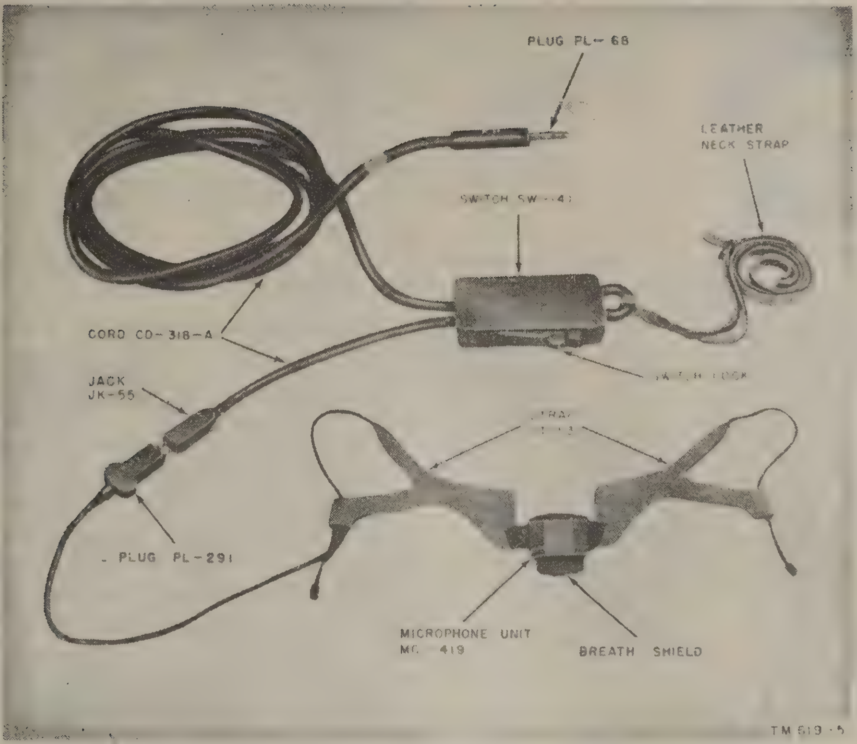


Figure 21. Microphone T-45 and cord CD-318-A.

18. Loudspeaker LS-7

This is a dynamic speaker of the permanent magnet type with a 4-inch cone. A self-contained matching transformer enables it to be connected to loads of 4,000 ohms output impedance. The unit is connected to the receiver through either of the jacks marked PHONES on the receiver panel; the impedance-matching control on the back of the receiver must be switched to the 4,000-ohm position.

19. Power Cords

a. Cord CD-1119 (fig. 26). Cord CD-1119 is 34½ inches long.

This four-conductor cable is terminated at one end by a four-prong female receptacle for connection to the four-prong plug marked BATTERY on the transmitter panel. On the other end, a four-prong male battery plug is attached for connection to Battery BA-48.

b. Power Cords CD-1086 (fig. 27). Two main power cords are supplied, Cord CD-1086 (44 inches long) and Cord CD-1086 (7 feet long). Cords CD-1086 are eight-conductor cables shielded with neoprene outer jackets. Cables are terminated at one end with one male, and, at the other end, one female nine-contact plug. Cords CD-1086 are used to supply power from either Vibrator Power Unit PE-237 or Generator GN-58-(*) to Receiver-Transmitter RT-77/GRC-9. The female connector plugs into the male receptacle marked POWER on the transmitter panel.

20. Running Spares

A group of running spares is supplied with each Radio Set AN/GRC-9 and is stored in the compartments of Box BX-53, Roll BG-174, and in Vibrator Power Unit PE-237. Spares are provided for all normally expendable items such as tubes, pilot lamps, neon bulbs, and whip antenna sections. Extra vibrators for Vibrator Power Unit PE-237 are contained within its case. For a list of running spares, see paragraph 6.

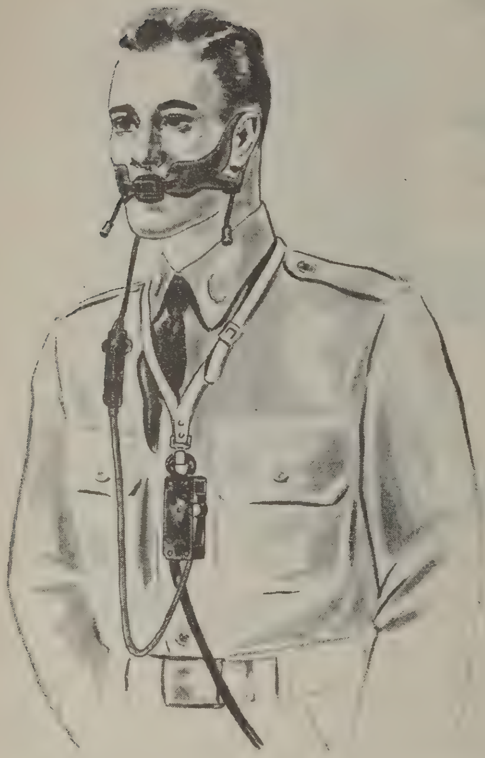


Figure 22. Microphone T–45 in use.

21. Additional Equipment Required

The following equipment is not supplied as part of Radio Set AN/GRC–9 but may be required for use in the radio set.

a. Battery BA–48, for the operation of the receiver only.

b. Vehicular storage battery, either 6, 12, or 24 volts.

22. Differences in Models

a. RECEIVER-TRANSMITTER RT–77/GRC–9. Most of the models of the receiver-transmitter are identical in physical appearance. In those models having serial numbers 11101 through 14464, keying relay K101 is mounted in the same position in which capacitors C128A, B, and C are shown (fig. 103). Capacitors C128A, B, and C are mounted in the position in which relay K101 is shown (fig. 103). In early models, the screen circuits of tubes V1 and V3 are connected together and are not under the control of R-F GAIN control Ⓟ when control Ⓛ is in NET position. In later models, the screen grid of tube VI is controlled by the R-F GAIN control for all positions of control Ⓛ. Other electrical circuit differences are discussed in chapter 5, sections I and II.

b. GENERATOR GN–58–(*). Several changes have been made in the various models and these are discussed in chapter 5, section III.

c. VIBRATOR POWER UNIT PE–237. The changes on this unit are discussed in chapter 5, section IV.

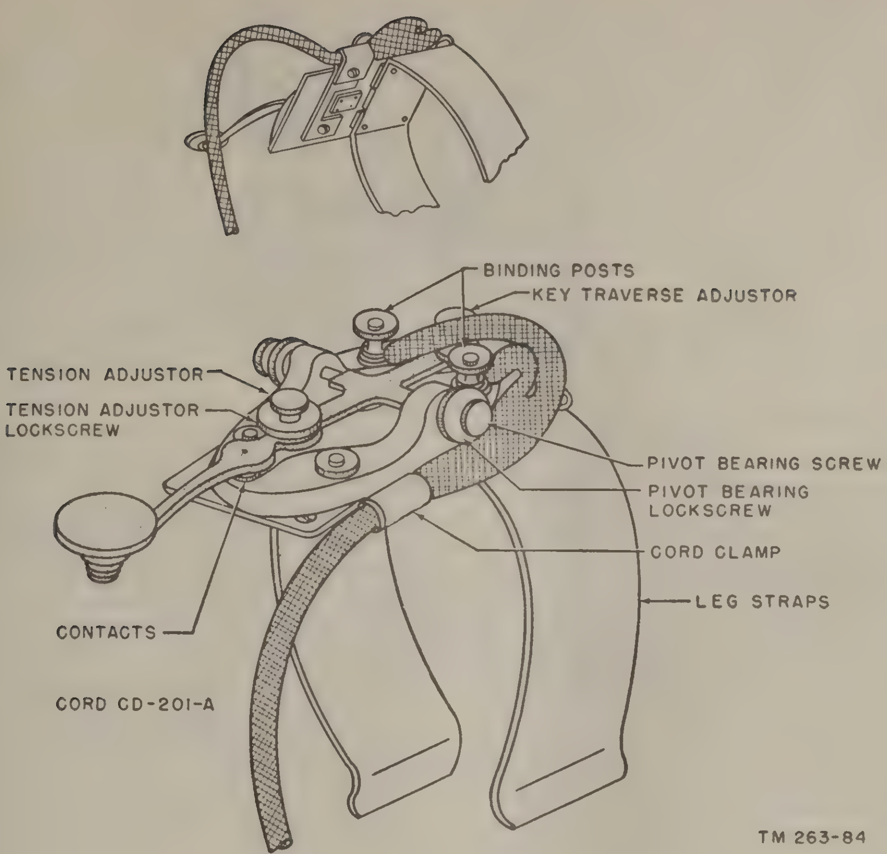

BINDING POSTS
KEY TRAVERSE ADJUSTOR
TENSION ADJUSTOR
TENSION ADJUSTOR LOCKSCREW
PIVOT BEARING SCREW
PIVOT BEARING LOCKSCREW
CORD CLAMP
LEG STRAPS
CONTACTS
CORD CD-201-A
TM 263-84

Figure 23. Key J-45.

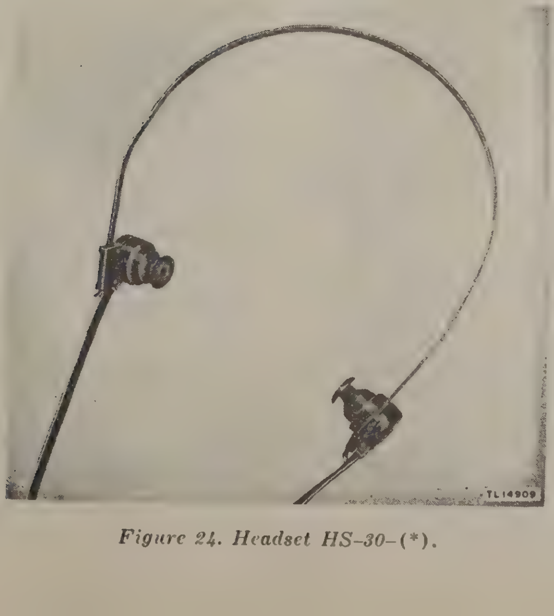


Figure 24. Headset HS-30-(*).

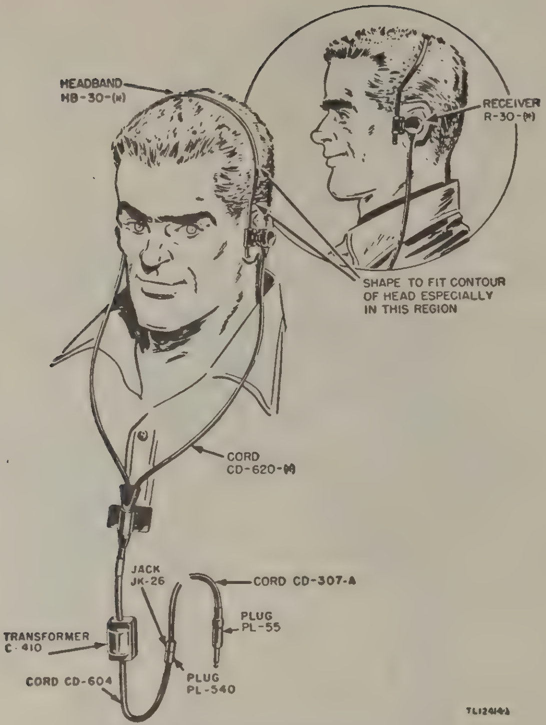

HEADBAND
HB-30-(*)
RECEIVER
R-30-(*)
SHAPE TO FIT CONTOUR
OF HEAD ESPECIALLY
IN THIS REGION
CORD
CD-620-(*)
JACK
JK-26
CORD CD-307-A
PLUG
PL-55
TRANSFORMER
C-410
CORD CD-604
PLUG
PL-540

Figure 25. Headset HS–30–(*) in use.

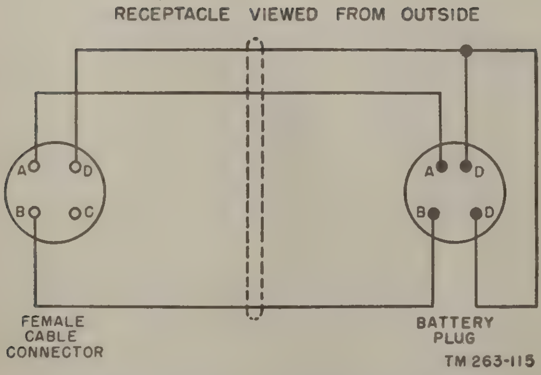

RECEPTACLE VIEWED FROM OUTSIDE
A
D
B
C
A
D
B
D
FEMALE
CABLE
CONNECTOR
BATTERY
PLUG
TM 263-115

Figure 26. Cord CD–1119, internal wiring.

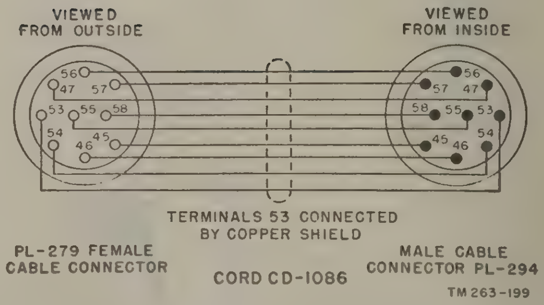

VIEWED
FROM OUTSIDE
VIEWED
FROM INSIDE
56
47
57
53
55
58
54
46
45
56
57
47
58
55
53
45
46
54
TERMINALS 53 CONNECTED
BY COPPER SHIELD
PL-279 FEMALE
CABLE CONNECTOR
CORD CD-1086
MALE CABLE
CONNECTOR PL-294
TM 263-199

Figure 27. Cord CD–1086, internal wiring.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF RADIO SET AN/GRC–9

23. Siting
(fig. 28)

a. One of the most important factors to assure satisfactory transmission and reception of radio signals is the location of the antenna. The transmitter and receiver will have a greater range if the antenna is located in a position which is high and clear of hills, buildings, cliffs, densely wooded areas, and other obstructions. Dips, depressions, valleys, and low places are poor for radio transmission and reception because the surrounding high terrain tends to impede the r-f energy. Weak signals may be expected if the radio set is operated close to steel bridges, underpasses, or near power lines or power circuits (fig. 28).

b. The most desirable location for transmission and reception are hilltops, elevations, and slight rises of ground. Flat terrain also is good. As a general rule, transmission is better over water than over land. When selecting a flat site, remember that a tall object must be available for fastening the antenna if the straight-wire or doublet antenna is used. When the vertical mast is used, provisions are made on the receiver-transmitter to fasten the antenna by means of a mast antenna mounting.

Note. The whip antenna will require a circle of flat ground approximately 30 feet in diameter, and the supports for the straight-wire antenna should be spaced approximately 265 feet apart. The ground under the whip or vertical antenna must be free of rock so that stakes can be driven to support the guy wires for the antenna.

c. Maximum range can be expected when operating on top of a hill or knoll. Do not operate the radio set in a valley unless short distance ranges are to be expected or unless it is necessary.

24. Uncrating, Unpacking, and Checking New Equipment

a. GENERAL. Equipment may be shipped in oversea packing cases as in figure 29, in domestic packing cases, or in its own carrying bags. When new equipment is received, select a location where the equipment may be unpacked without exposure to the elements and which is convenient to the permanent or semipermanent installation of the equipment. The instructions in *b* below apply to equipment shipped in export packing cases, and the instructions in *d* below to equipment shipped in domestic packing cases. Paragraph 6*c* lists the contents of all carrying bags and should be used for checking to make sure that all components are present and the equipment is undamaged. No special unpacking and uncrating procedures are necessary for equipment shipped in the carrying bags.

Note. Be careful in uncrating, unpacking, and handling the equipment; it can easily be damaged. If it becomes damaged or if left exposed to the elements, the equipment might be rendered useless and a complete overhaul might be required.

b. STEP-BY-STEP INSTRUCTIONS FOR UNCRATING AND UNPACKING EXPORT SHIPMENTS, SPECIFICALLY THE EQUIPMENT PROCURED ON ORDER NO. 10250-PHILA-49.

(1) Place the packing case as near the operating position as convenient.
(2) Cut and fold back the steel straps.
(3) Remove the nails with a nailpuller (fig. 30E). Remove the top of the packing case. Do not attempt to pry off the sides and top; the equipment may be damaged.
(4) Open the various cardboard cartons. If the packing case contains the vibrator power supply, remove it from its base

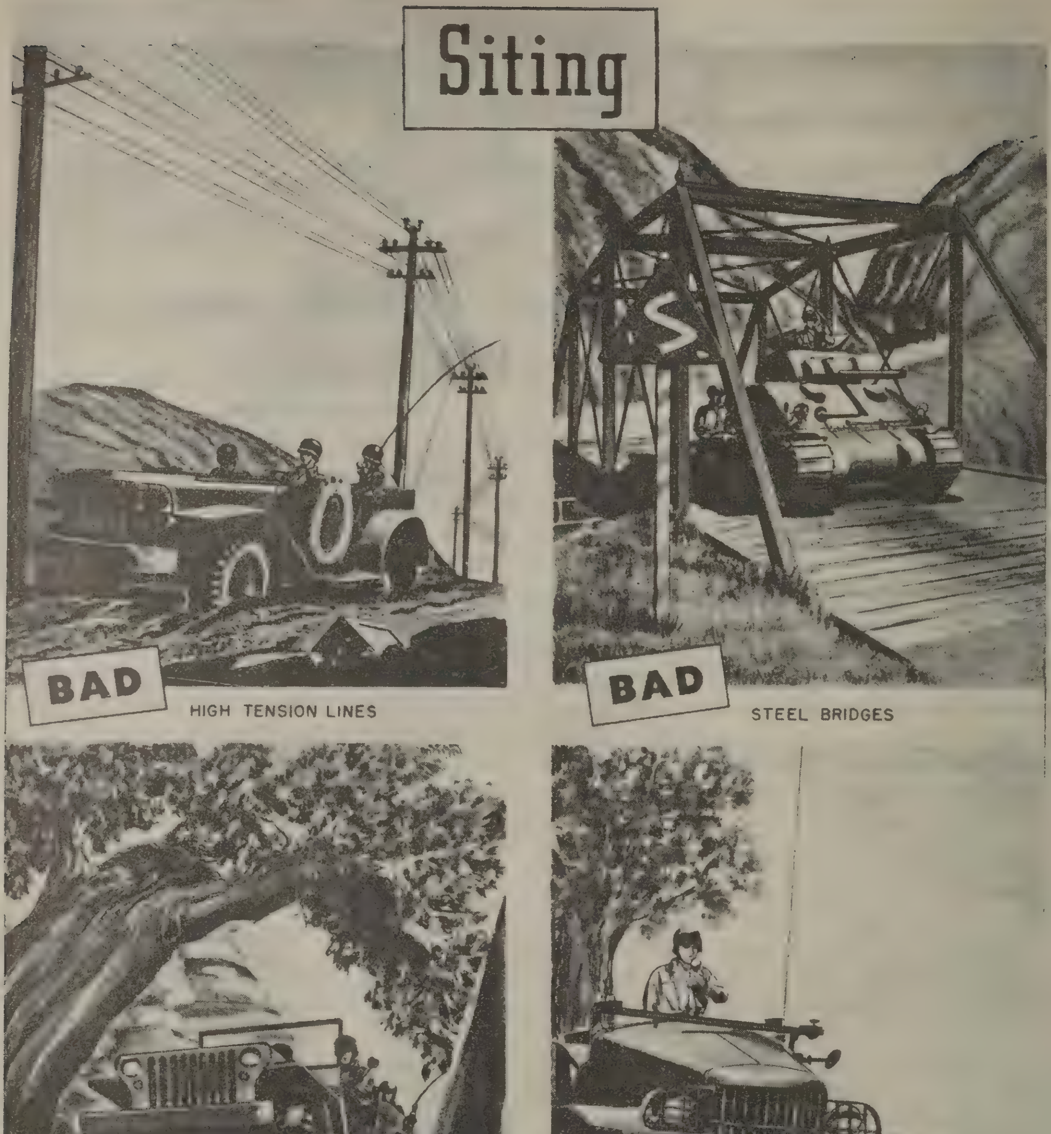

Siting
BAD
HIGH TENSION LINES
BAD
STEEL BRIDGES
BAD
VALLEYS OR DEPRESSIONS
GOOD
HILLTOP OR FLAT TERRAIN
TL15285

Figure 28. Siting.

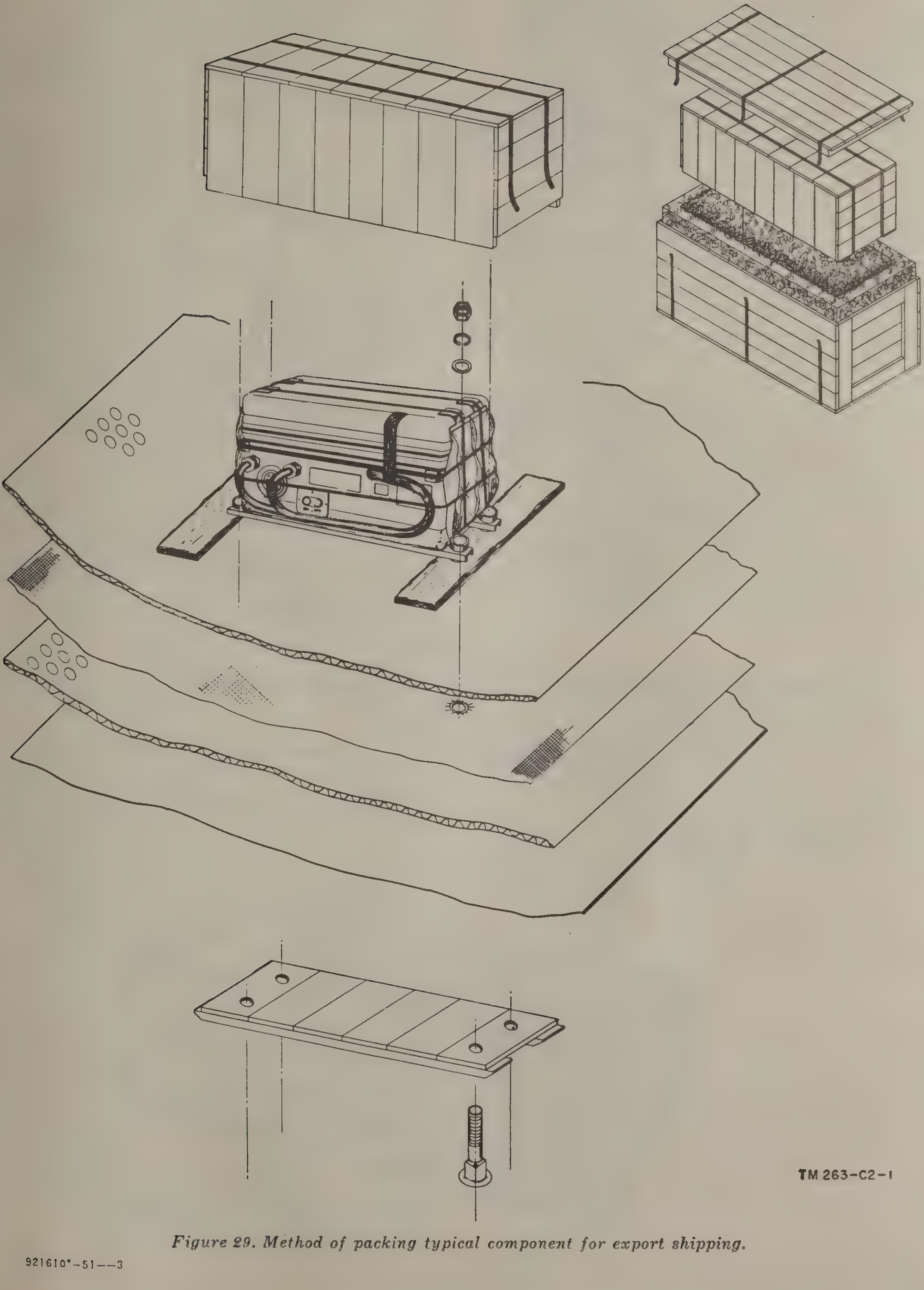


Figure 29. Method of packing typical component for export shipping.

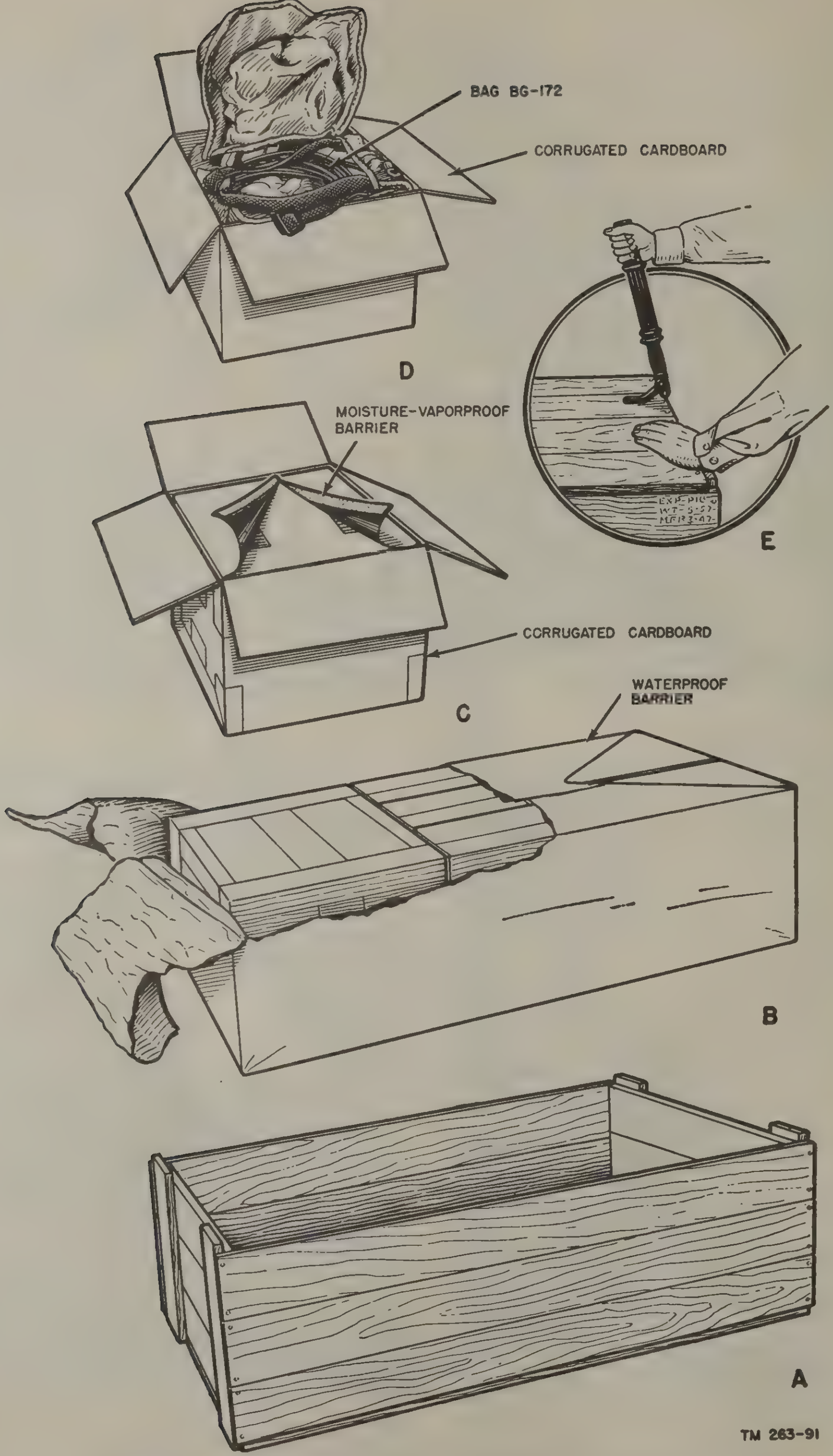

BAG BG-172
CORRUGATED CARDBOARD
D
MOISTURE-VAPORPROOF BARRIER
EXP-PIC
WT-5-57-
MFR 3-47-
E
CORRUGATED CARDBOARD
C
WATERPROOF BARRIER
B
A
TM 263-91

Figure 30. Typical packaging of radio set AN/GRC-9 components.

by removing the four mounting bolts from the skids (fig. 29).

(5) Remove the moisture-vaporproof barrier as shown in figure 30C.

(6) Open the inner carton and remove the cushioning material and the bags of desiccant (fig. 30D).

(7) Inspect all equipment for possible damage during shipment.

c. CHECKING. Check the contents against the master packing slips.

d. UNPACKING DOMESTIC PACKING CASES. Radio equipment may be received in domestic packing cases. The instructions given in *b* above apply also to unpacking domestic shipments. In general, follow the procedure below:

(1) Cut the metal bands.

(2) Open the cartons that protect the equipment; or, if heavy wrapping paper is used, remove it carefully and take out the components.

(3) Check the contents of the packing case against the master packing slip.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

25. Selection of Antenna Equipment for Field Operation

a. Most satisfactory performance will be obtained with the selection of the proper antenna, considering the advantages and the disadvantages of each of the three types available for Radio Set AN/GRC–9.

(1) When a permanent or semipermanent installation can be made, use the long-wire antenna. It will transmit farther and receive weak signals more satisfactorily than the whip antenna.

(2) However, when the equipment must be moved rapidly and frequently from one location to another or is used as a vehicular installation (par. 34), use the vertical mast antenna.

b. The advantages of the vertical mast antenna are:—

(1) It can be set up or taken down quickly.

(2) It will permit satisfactory transmission and reception over short distances (up to approximately 25 miles).

(3) The space required is small.

(4) The presence of tall objects for support is not required.

(5) It permits transmission equally well in all directions.

(6) The antenna can be quickly tuned from one end of the frequency band to the other.

c. The principal disadvantage of the vertical mast antenna is that it is not highly efficient for distance in excess of 25 miles, as compared to the long-wire antenna.

d. The principal advantage of the long-wire antenna is its transmission efficiency. When properly installed, it will permit satisfactory transmission and reception over comparatively long distances.

e. The principal disadvantages of the long-wire antenna are—

(1) It requires tall objects for support.

(2) The antenna length must be changed if the frequency is to be shifted appreciably (more than 200 kc).

(3) The direction of maximum transmission with respect to the orientation of the antenna will depend on the length of the antenna.

26. Installation of Long-wire Antenna

For installation of long-wire Antennas AT–101/GRC–9 and AT–102/GRC–9, proceed as follows:

a. Select an open area where two upright supports for the antenna can be found, such as two trees. A minimum length of 250 feet is required to allow for the full length of the antenna at the low frequencies.

b. Making use of trees, buildings, or fence posts, erect the antenna as high as possible. In no case should the antenna be lower than 6 feet.

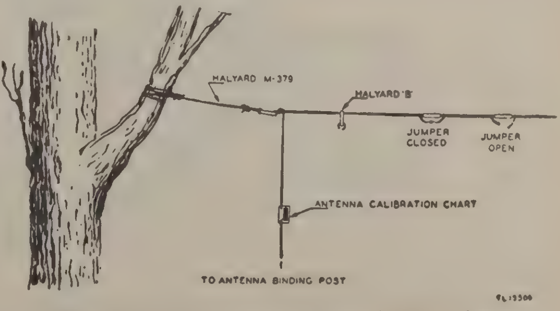
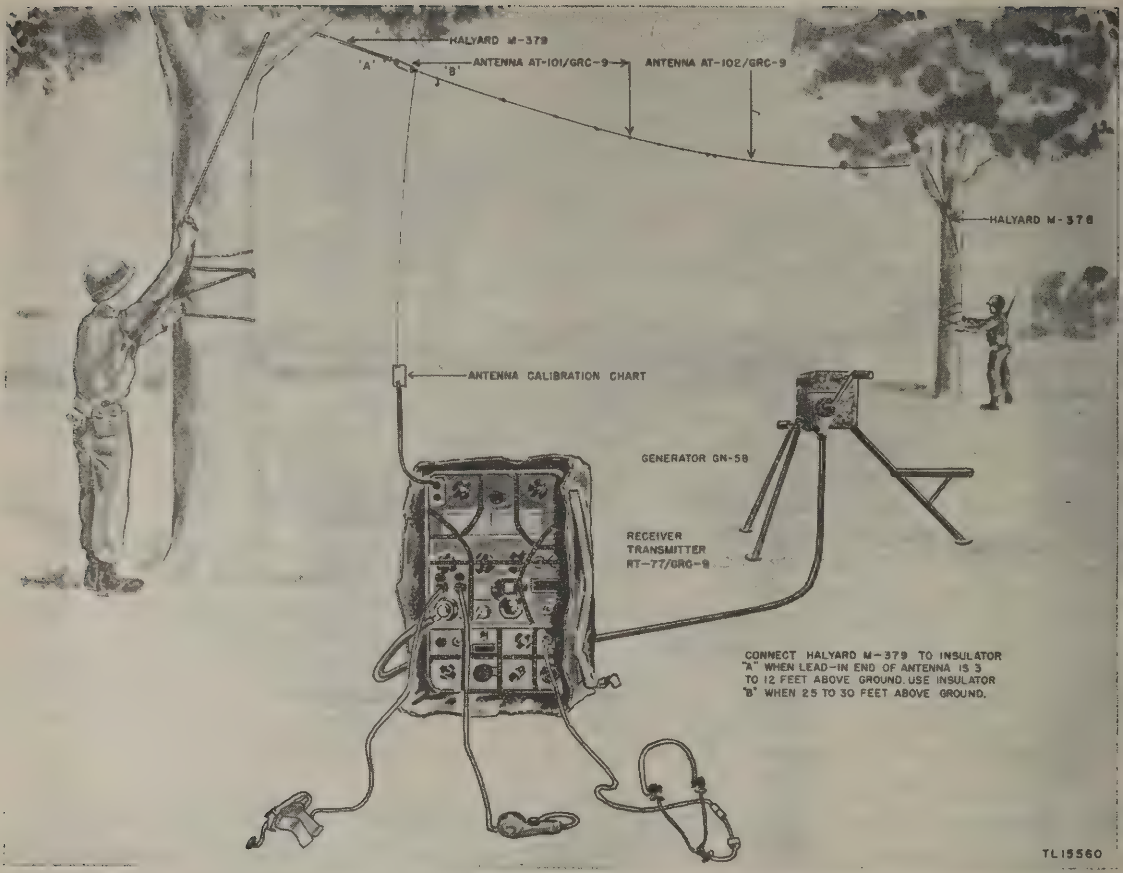


Figure 31. Antenna supports and connections.


HALYARD M-379
'A'
'B'
ANTENNA AT-101/GRC-9
ANTENNA AT-102/GRC-9
HALYARD M-378
ANTENNA CALIBRATION CHART
GENERATOR GN-58
RECEIVER TRANSMITTER RT-77/GRC-9
TL15560

CONNECT HALYARD M-379 TO INSULATOR "A" WHEN LEAD-IN END OF ANTENNA IS 3 TO 12 FEET ABOVE GROUND. USE INSULATOR "B" WHEN 25 TO 30 FEET ABOVE GROUND.

Figure 32. Installation of long-wire antennas AT-101/GRC-9 and AT-102/GRC-9.

c. Connect Antenna AT-101/GRC-9 to its support by means of Halyard M-379, as shown in figure 31. This length of antenna is shown with the calibration chart attached.

d. Connect the clip on Antenna AT-102/GRC-9 to the small ring on the free end of Antenna AT-101/GRC-9 and fasten the other end of Antenna AT-102/GRC-9 to its support by Halyard M-378. In figure 32, the entire installation of the long-wire antenna is shown.

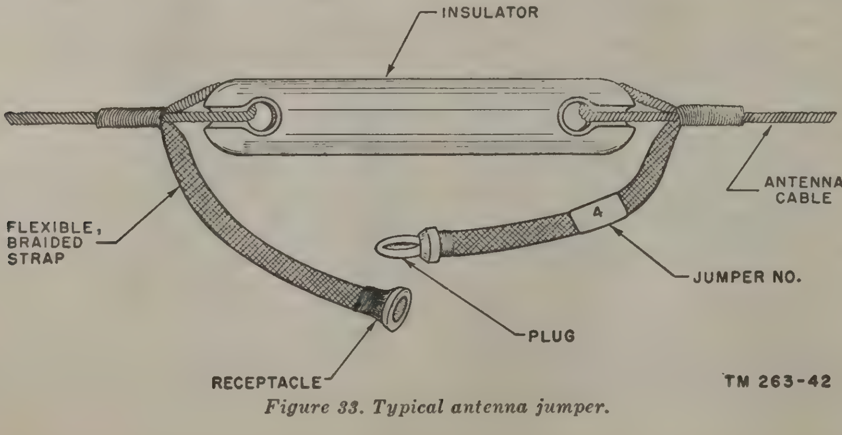
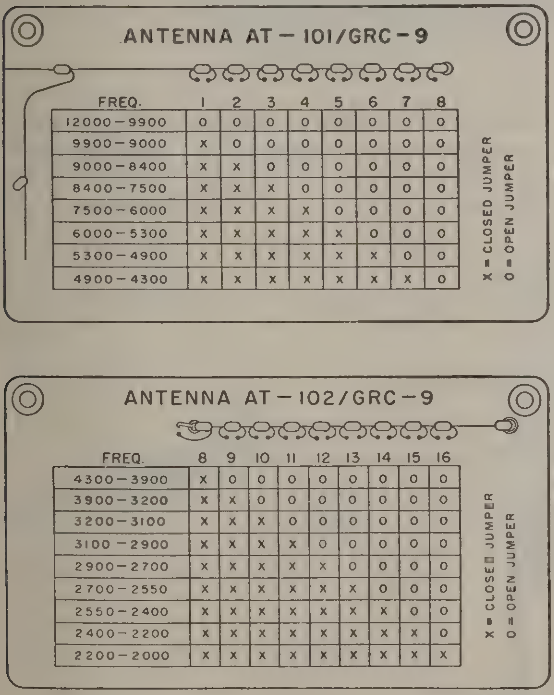

INSULATOR
ANTENNA CABLE
FLEXIBLE, BRAIDED STRAP
4
JUMPER NO.
PLUG
RECEPTACLE
TM 263-42

Figure 33. Typical antenna jumper.

e. Locate the radio set at any point that will not allow the lead-in to touch the ground or any other objects such as trees, buildings, or metal fences. Connect the lead-in from the calibration chart end of the antenna to the ANT. binding post on the transmitter.

Note. Since the antenna length, for the best transmission and reception, is directly dependent on the frequency of the signal, it is necessary to adjust the antenna length to the frequency at which the transmitter is to be operated. Jumpers are placed on the antenna. The calibration chart, showing the length of the antenna required for the various frequencies, indicates which jumpers must be opened and closed for the frequencies. A typical jumper is shown in figure 33.

f. In case the antenna calibration chart should be lost or become illegible, it is reproduced here exactly as it looks (fig. 34). The number of antenna lengths to be closed in succession always should start at the lead-in end.



ANTENNA AT-101/GRC-9

FREQ.	1	2	3	4	5	6	7	8
12000-9900	O	O	O	O	O	O	O	O
9900-9000	X	O	O	O	O	O	O	O
9000-8400	X	X	O	O	O	O	O	O
8400-7500	X	X	X	O	O	O	O	O
7500-6000	X	X	X	X	O	O	O	O
6000-5300	X	X	X	X	X	O	O	O
5300-4900	X	X	X	X	X	X	O	O
4900-4300	X	X	X	X	X	X	X	O

X = CLOSED JUMPER
O = OPEN JUMPER

ANTENNA AT-102/GRC-9

FREQ.	8	9	10	11	12	13	14	15	16
4300-3900	X	O	O	O	O	O	O	O	O
3900-3200	X	X	O	O	O	O	O	O	O
3200-3100	X	X	X	O	O	O	O	O	O
3100-2900	X	X	X	X	O	O	O	O	O
2900-2700	X	X	X	X	X	O	O	O	O
2700-2550	X	X	X	X	X	X	O	O	O
2550-2400	X	X	X	X	X	X	X	O	O
2400-2200	X	X	X	X	X	X	X	X	O
2200-2000	X	X	X	X	X	X	X	X	X

X = CLOSE JUMPER
O = OPEN JUMPER

TM 263-41

Figure 34. Antenna calibration chart.

g. If the antenna should be lost or destroyed, another one can be made from any other stranded copper wire available. The following chart gives the correct lengths *including the lead-in.*

Transmitting frequency (kc)		Antenna length, including lead-in (ft)
From	*To*	
2,000	2,200	245.5
2,200	2,400	228.0
2,400	2,550	210.0
2,550	2,700	193.0
2,700	2,900	177.5
2,900	3,100	163.0
3,100	3,200	151.5
3,200	3,900	139.0
3,900	4,300	122.0
4,300	4,900	107.5
4,900	5,300	93.0
5,300	6,000	85.5
6,000	7,500	73.5
7,500	8,400	63.0
8,400	9,000	57.5
9,000	9,900	53.0
9,900	12,000	46.0

27. Installation of Whip Antenna

a. Place the radio set in an area free of large obstructions such as trees, buildings, and power lines.

b. Set up the counterpoise by placing link Counterpoise CP-13 on top of Counterpoise CP-12 and clamping them together by means of the wingnut attached (fig. 17).

c. Spread out the eight wires of Counterpoises CP-12 and CP-13 as far as they will reach radially, like the spokes of a wheel. To hold the counterpoises in place, drive Stake GP-27-A through one of the holes in the connecting links. Connect the heavy lead on the bar of Counterpoise CP-12 to the GND. post on the receiver panel.

d. Extend the hinged supports on the side of the radio set case through the opening in the side of Bag CW-140/GRC-9. Insert Insulator IN-127 in these supports.

e. Connect the binding post marked ANT. on the transmitter panel to the insulator binding post with a 12-inch length of Wire W-128. Run the wire through the upper hinge slot in the bag.

f. Screw together three Mast Sections MS-116-A, one Mast Section MS-117-A, and one Mast Section MS-118-A.

g. Close the clamp ring of Guy GY-42 and hook the end of Guy GY-12 through the holes

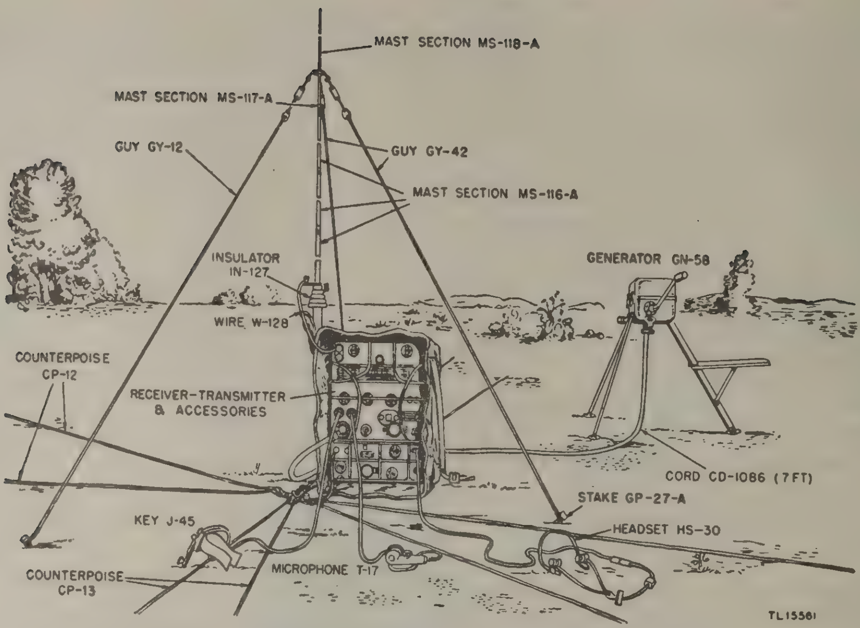

MAST SECTION MS-118-A
MAST SECTION MS-117-A
GUY GY-12
GUY GY-42
MAST SECTION MS-116-A
INSULATOR IN-127
GENERATOR GN-58
WIRE W-128
COUNTERPOISE CP-12
RECEIVER-TRANSMITTER & ACCESSORIES
CORD CD-1086 (7 FT)
STAKE GP-27-A
KEY J-45
HEADSET HS-30
MICROPHONE T-17
COUNTERPOISE CP-13
TL15561

Figure 35. Radio set AN/GRC–9 set up for normal field use.

in the collar clamps to keep the clamps closed (fig. 36). Insert Mast Section MS–116–A into Insulator IN–127.

h. Slip Stakes GP–27–A through the S hooks attached to the ends of the guy cords and drive the stakes into the ground at equally spaced points around the set to hold the mast erect (fig. 35).

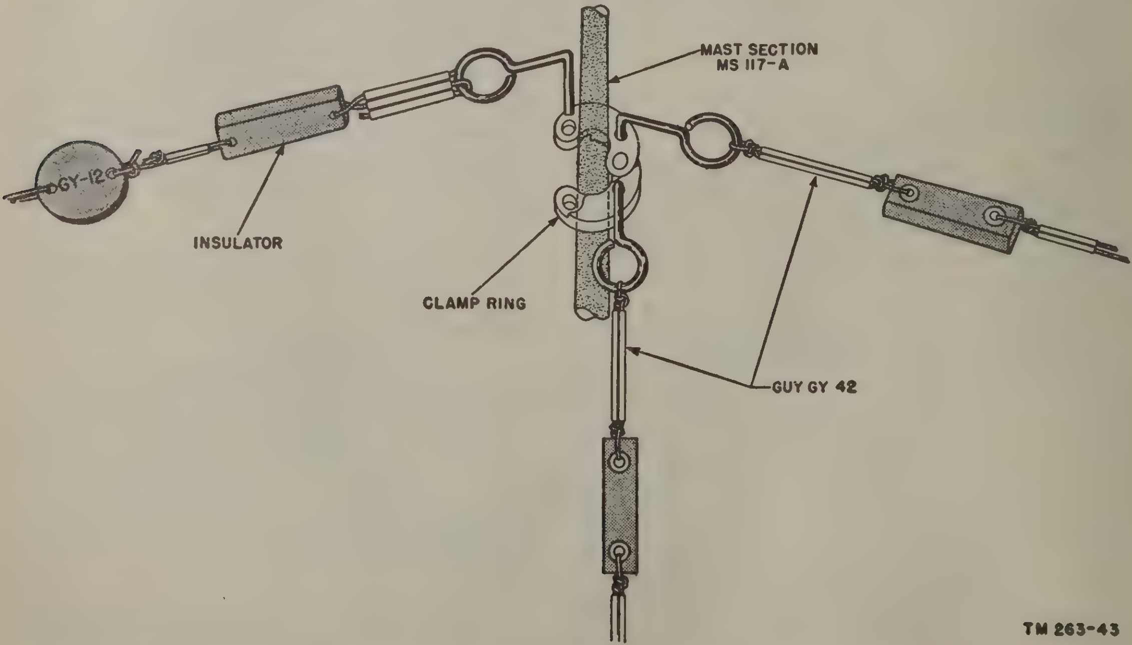

MAST SECTION MS 117-A
GY-12
INSULATOR
CLAMP RING
GUY GY 42
TM 263-43

Figure 36. Clamp ring for connecting guy cords to vertical mast antenna.

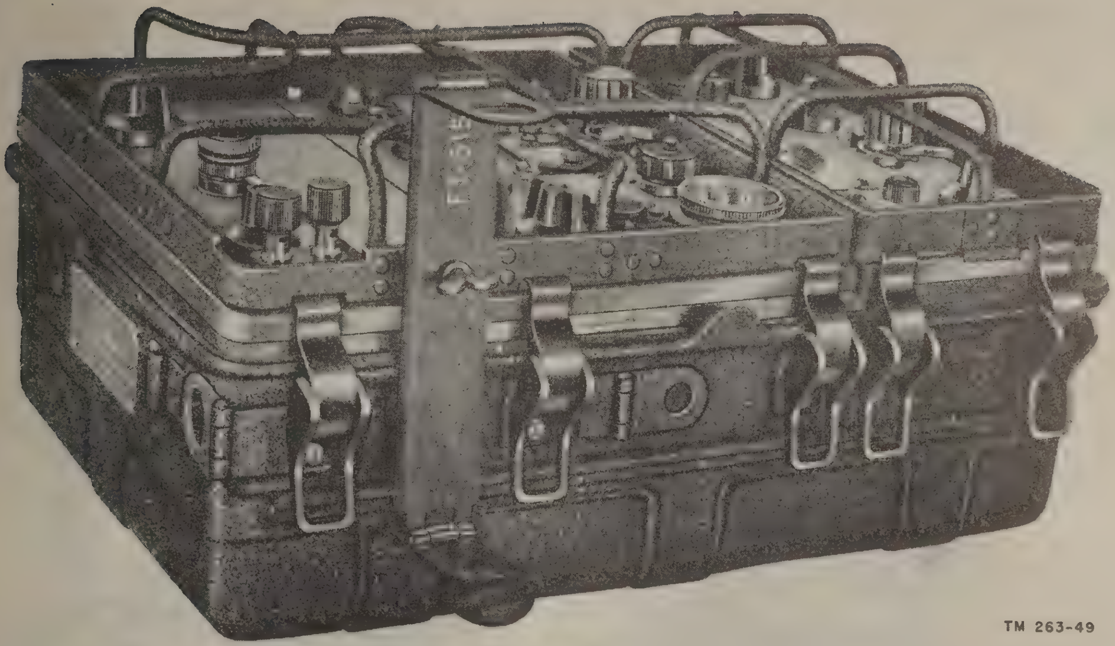


Figure 37. Application of bracket FT–515.

28. Bracket FT–515

If it is necessary to operate the radio set in a horizontal position, the antenna is mounted by means of Bracket FT–515. This is shown in Figure 37.

29. Doublet Antenna

At times, the possibility arises that the radio set must be used as a semipermanent installation to hold communication with other sets located in a fixed direction from the first set. In this case, a doublet antenna is advised because of its greater directivity when operated as a half-wave radiator. The lead-in or feeder to the doublet antenna should be a 50- to 72-ohm transmission line, whose ends are attached to the ANT. and DOUBLET binding posts on the transmitter panel. It is cautioned that a doublet antenna must not be used unless the exact locations of the other radio stations are known, so that the antenna may be orientated for the maximum transmission in that direction. The correct orientation is shown in figure 38. The following table gives the antenna lengths necessary for maximum transmission efficiency over the frequency range of Radio Set AN/GRC–9.

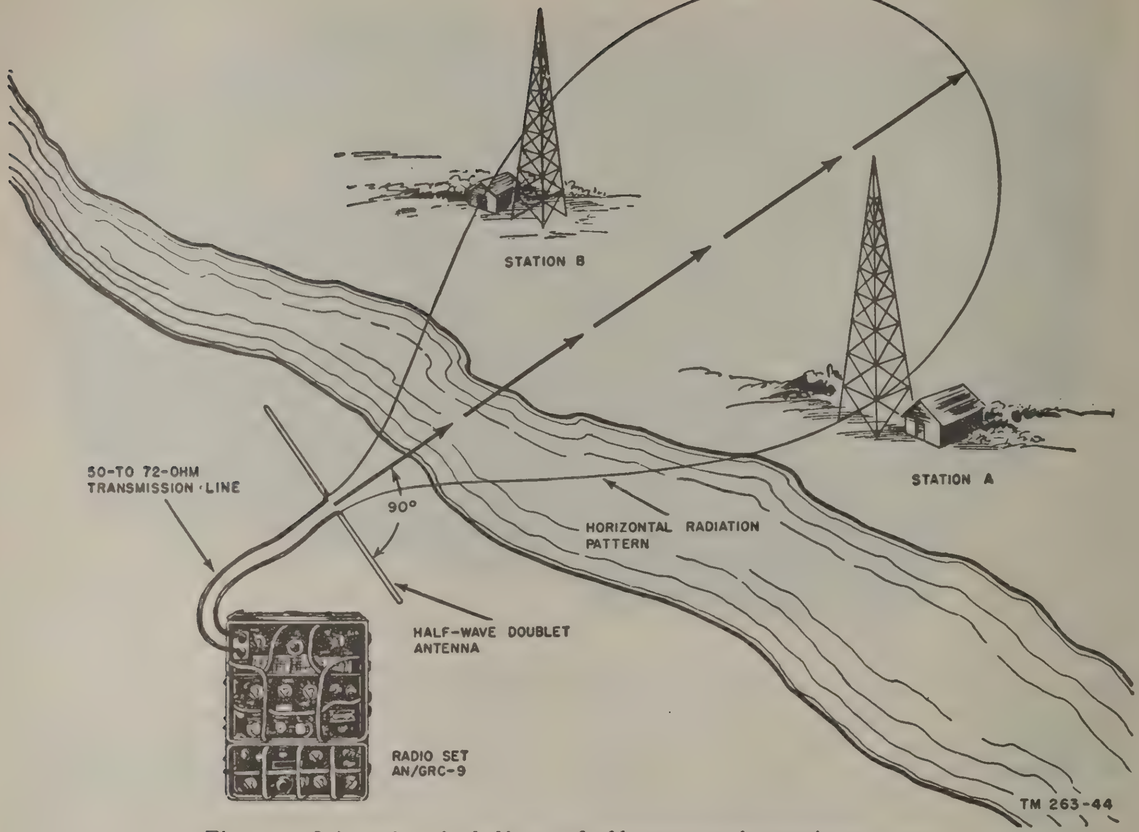

STATION B
STATION A
50-TO 72-OHM TRANSMISSION LINE
90°
HORIZONTAL RADIATION PATTERN
HALF-WAVE DOUBLET ANTENNA
RADIO SET AN/GRC-9
TM 263-44

Figure 38. Orientation of a half-wave doublet antenna for maximum range.

Frequency range		Antenna "L" in feet ¼ wave (each side of feeders)	Feeders length
From	*To*		
2,000	2,200	116 ft 7 in.	95 ft 6 in.
2,200	2,400	106 ft 6 in.	87 ft
2,400	2,575	98 ft	80 ft 6 in.
2,575	2,725	91 ft 10 in.	75 ft 6 in.
2,725	2,875	86 ft 10 in.	71 ft 6 in.
2,875	3,025	82 ft 3 in.	68 ft
3,025	3,150	78 ft 7 in.	65 ft
3,150	3,250	75 ft 10 in.	62 ft 6 in.
3,250	3,350	73 ft 6 in.	60 ft 6 in.
3,350	3,440	71 ft 7 in.	59 ft
3,440	3,520	69 ft 10 in.	57 ft 6 in.
3,520	3,600	68 ft	56 ft 6 in.
3,600	3,725	66 ft	54 ft 6 in.
3,725	3,850	63 ft 9 in.	53 ft
3,850	3,975	61 ft 8 in.	51 ft
3,975	4,100	59 ft 8 in.	49 ft 6 in.
4,100	4,225	57 ft 10 in.	48 ft
4,225	4,350	56 ft 3 in.	47 ft
4,350	4,475	54 ft 9 in.	45 ft 6 in.
4,475	4,600	53 ft 3 in.	44 ft 6 in.
4,600	4,725	51 ft 9 in.	43 ft
4,725	4,850	50 ft 6 in.	42 ft
4,850	5,000	49 ft	41 ft
5,000	5,150	47 ft 6 in.	39 ft 6 in.
5,150	5,300	46 ft	38 ft 6 in.
5,300	5,450	44 ft 8 in.	37 ft 6 in.
5,450	5,600	43 ft 3 in.	36 ft 6 in.
5,600	5,750	42 ft	35 ft 6 in.
5,750	5,900	40 ft 11 in.	34 ft 6 in.
5,900	6,100	39 ft 8 in.	33 ft 6 in.
6,100	6,300	38 ft 3 in.	32 ft 6 in.
6,300	6,500	37 ft	31 ft 6 in.
6,500	6,900	35 ft 10 in.	30 ft 6 in.
6,900	7,500	32 ft 10 in.	28 ft
7,500	8,100	30 ft 2 in.	25 ft 6 in.
8,100	8,700	28 ft	24 ft
8,700	9,300	26 ft	22 ft 6 in.
9,300	9,900	24 ft 4 in.	21 ft
9,900	10,500	23 ft	19 ft 6 in.
10,500	11,100	21 ft 10 in.	18 ft 6 in.
11,100	12,000	20 ft 3 in.	17 ft 6 in

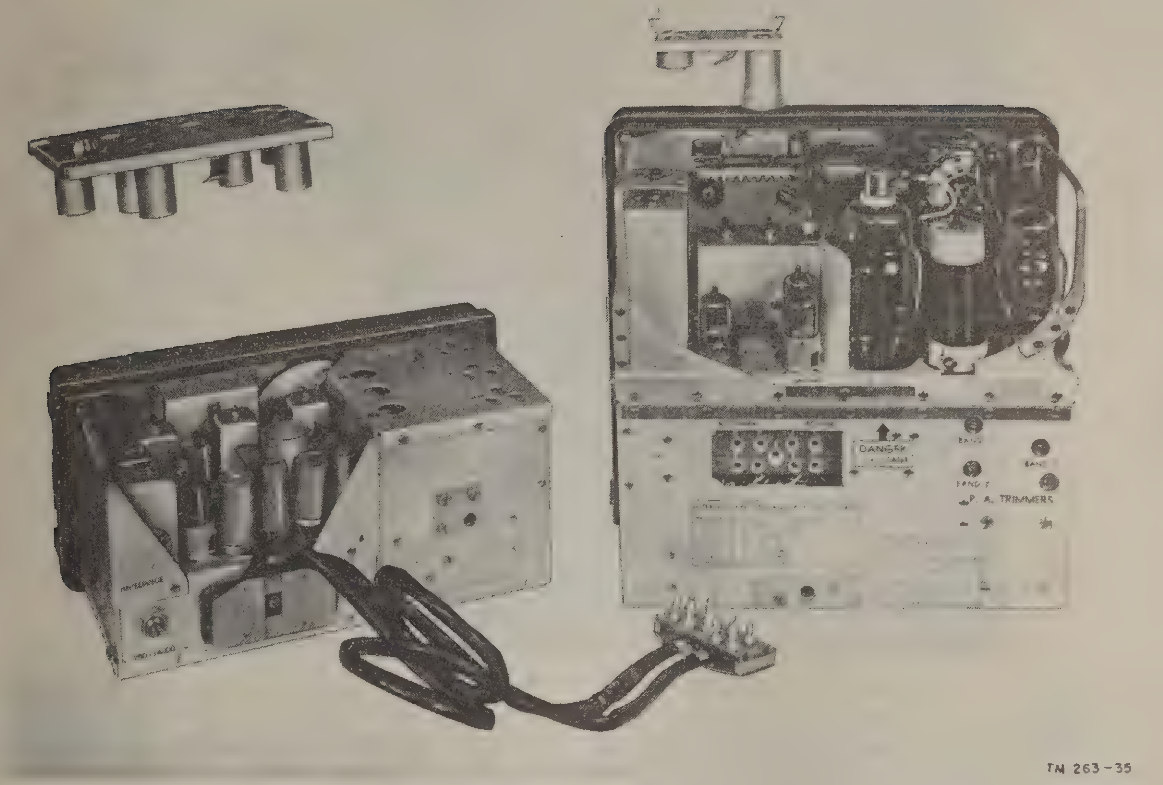


Figure 39. Rear view of transmitter and receiver, and cable 3E7173-22.

30. Installation of Receiver Tubes and Crystal

a. The receiver tubes and crystal are already installed when shipped. To inspect or replace them, proceed as follows: Remove the cover of Receiver-Transmitter RT-77/GRC-9 (par 8*b*). Lift the receiver portion partially out of the case and remove the plug of cable 3E7173-22 (fig. 39). The tubes and crystal are located beneath a single metal cover (fig. 39) which is removed without tools.

Caution: Remove this cover by releasing all four cover retaining springs and then lifting cover straight up without tilting it. This is necessary to avoid any damage which may occur if the tube shields on the cover are forced, pushing any tube which is in the receiver, thus causing the tube prongs to snap. Insert or replace tubes and crystal as necessary in accordance with the tube layout chart on the side of the receiver. The same information is found on the cover just removed.

b. There are seven tubes; each one will fit into its socket in only one position. Do not jam the tube in the socket. Rotate the tube gently, until the tube prongs are lined up with their corresponding socket holes; then press the tube straight down into its socket.

Note. Do not mistake the transmitter tubes for receiver tubes. Some transmitter tubes look exactly like those used in the receiver.

c. There is only one crystal to be inserted. To remove the crystal, insert a screw driver between bias cell BT1 and capacitor C55 and gently pry the crystal upward, and, at the same time, pull it with the fingers. The dial light lamp may be removed by using the pilot lamp puller contained in Box BX-53 of carrying Bag BG-172 (fig. 40). Always remove the pilot lamp from the puller by pulling on the glass bulb and not the brass bayonet pin base.

31. Installation of Transmitter Tubes and Crystals

a. The receiver tubes and crystals are already installed when shipped. To inspect or replace them proceed as follows: When opening the

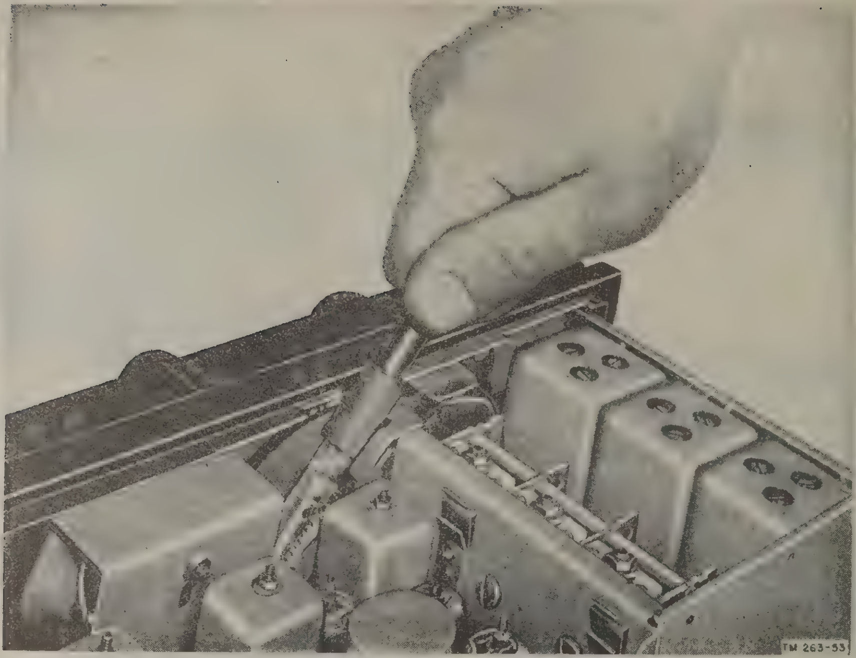


Figure 40. Removing pilot lamp.

transmitter, be sure that the power is shut off. Remove the receptacle of power Cord CD–1086 from the transmitter POWER receptacle. The power amplifier tube 2E22, V103, is easily accessible and may be removed by gently rocking it with a circular motion, pulling upward at the same time. Always remove the connection to the plate cap first. The voltage regulator tube VR105 (V104) can be removed by opening the safety clamp around the base of the tube. The clamp may be opened very easily by inserting a screw driver tip in the small slot on the clamping lever and by twisting the screw driver counterclockwise slowly. To tighten the clamp, twist the screw driver in a clockwise direction.

b. The remainder of the tubes and crystals are located under a small plate (fig. 39). The tubes are V101, V102, and V105 and the crystals are 1A, 1B, 2A, 2B, 3A, and 3B. The cover plate can be removed by releasing the spring catches at both ends of the plate and lifting straight upward. The tubes and crystals are then easily accessible. The tubes can be removed as shown in figure 41.

32. Installation of Generator GN–58–(*)

The hand generator is used to supply power to the receiver-transmitter during field or portable operation. The generator is carried in Bag BG–175 and the supporting legs are carried in antenna equipment Roll BG–174. To prepare the generator for operation, refer to figure 16 and proceed as follows:

a. Insert two Legs LG–3 upward through the metal loops on the side of the generator which has the order number plate on it. Be sure that the flat metal retaining springs fit into the hollow insides of the legs.

b. Rest the generator on the two legs and slip the bottom of the attachment of Leg LG–2–A into its retainer on the opposite face of the generator. Drop the metal loop over the top of the attachment on the leg.

c. Loosen the thumbscrew on the bottom plate covering the power cable socket and connect the male plug of Cord CD–1086 (7 feet) to the generator receptacle.

d. Loosen one screw on each of the cover plates for the handles, and swing the covers downward. On later models of the unit, the plates are forced open by a spring to expose the crank openings.

e. Insert Crank GC–7 into the sockets on the sides of the generator. The crank handles, when each is fully inserted, should be as far apart as

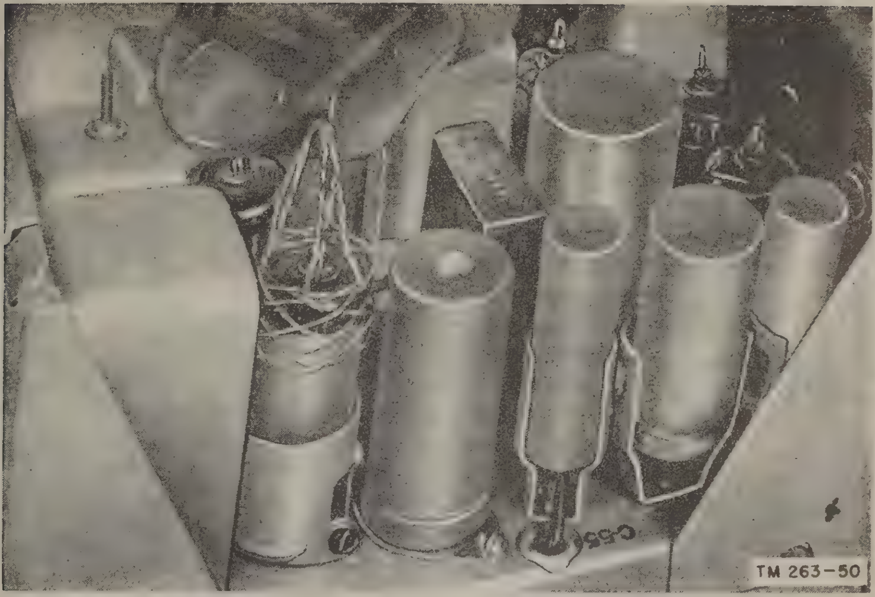


Figure 41. Removing tubes by means of tube puller; Kellems No. 11–16.

possible. This means that if one handle is at its nearest point to the ground, the other handle should be at its highest point in the air (fig. 16).

33. Connections

a. INTERNAL CONNECTIONS. The separate transmitter and receiver sections are connected by cable 3E7173–22 which is concealed by the front panels of the radio set. The cable is shown in figure 39. To replace the receiver and transmitter in the metal case, proceed as follows:

(1) Place the empty case in a horizontal position with the open face upward and insert either plug of cable 3E7173–22 through the opening in the left-hand corner of the separating partition.

(2) Insert the connecting cord plug into the corresponding jack on the back of the receiver chassis and gently lower the receiver into the cabinet and fasten the clamps along the side in accordance with paragraph 8.

(3) Next, place the cable in the small bracket riveted to the back of the case. It is important that this be done to protect the cable from any damage which may occur if it is left to move about freely inside the case. This cable bracket is not found in some models of Receiver-Transmitter RT–77/GRC–9.

(4) Connect the remaining plug of the cable to the jack on the back of the transmitter chassis and lower the transmitter gently into the case.

(5) Fasten the clamps on the side of the case to the transmitter panel.

b. EXTERNAL CONNECTIONS. Connect all operating components of Radio Set AN/GRC–9 in accordance with the cording diagram shown in figure 42 and the illustration in figure 43. Use the cords supplied with the radio set as follows:

(1) Install Cord CD–1086, connecting one end to the POWER receptacle on the radio set and the other end to Generator GN–58–(*) or Vibrator Power Unit PE–237. When using Generator GN–58-(*), use Cord CD–1086 (7 feet long). For Vibrator Power Unit PE–237, install Cord CD–1086 (3⅔ feet long). These two cords are both marked Cord CD–1086 and are identical except for length.

Note. Vibrator Power Unit PE–237 is used in vehicular installations. Refer to paragraphs 34 through 37.

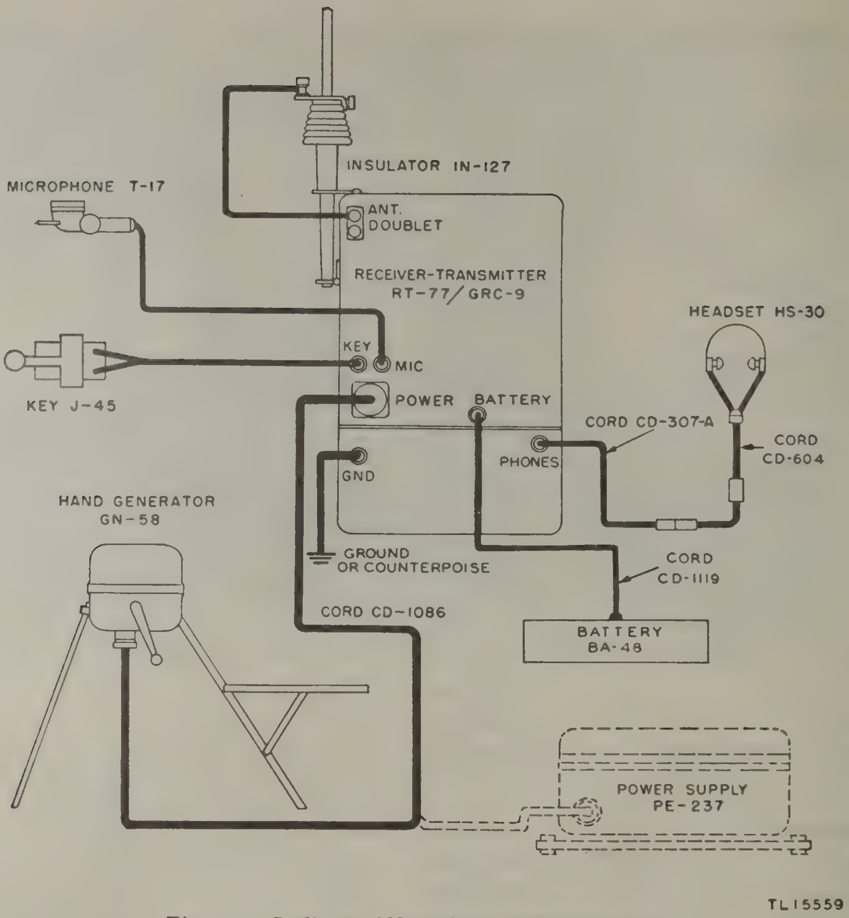

MICROPHONE T-17
INSULATOR IN-127
ANT.
DOUBLET
RECEIVER-TRANSMITTER
RT-77/GRC-9
HEADSET HS-30
KEY
MIC
KEY J-45
POWER
BATTERY
CORD CD-307-A
CORD
CD-604
PHONES
GND
HAND GENERATOR
GN-58
GROUND
OR COUNTERPOISE
CORD
CD-1119
CORD CD-1086
BATTERY
BA-48
POWER SUPPLY
PE-237
TL15559

Figure 42. Radio set AN/GRC-9, cording diagram.

(2) Insert Plug PL–55 of the headset into the PHONES jack on the receiver panel.

(3) Insert Plug PL–55 of Key J–45 into the KEY jack of the transmitter if the key is to be used.

(4) Insert Plug PL–68 of the microphone cord into the MIKE jack on the transmitter panel if the microphone is to be used.

(5) Connect the antenna lead into the antenna binding posts on the transmitter panel in accordance with paragraph 26, 27, or 29, whichever is appropriate.

(6) When using Battery BA–48 for operating the receiver only, or when used in conjunction with Generator GN–58–(*), connect Cord CD–1119 into Battery BA–48 and to the BATTERY receptacle on the transmitter panel.

34. Vehicular Installation

(fig. 44)

a. Complete instructions for standard vehicular radio installations are given in technical manuals of the TM 11–2700 series. One manual of this series is normally published for every common type of vehicle requiring radio installations, and new sections are added as new radio requirements arise. Refer to SR 310–20–4 for the applicable manual of the series.

b. For vehicular installations of Radio Set AN/GRC–9 not covered by a technical manual of the TM 11–2700 series, follow the general

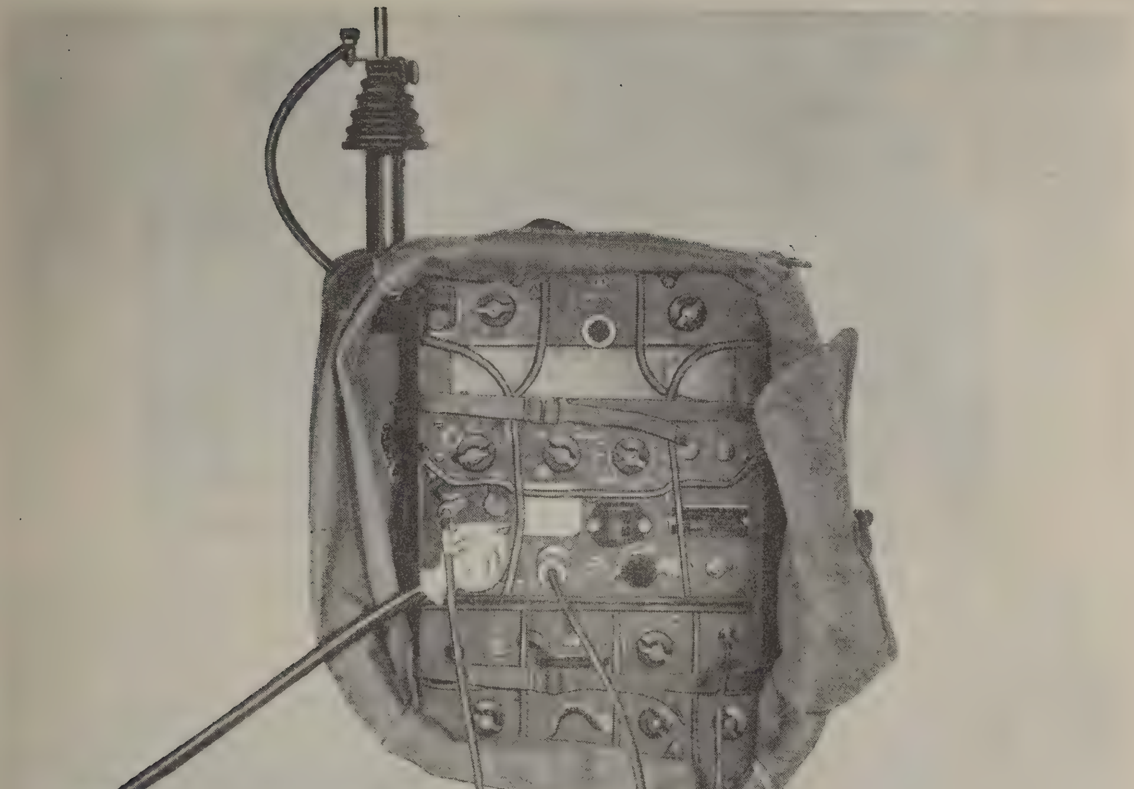


Figure 43. External connections to receiver-transmitter RT-77/GRC-9.

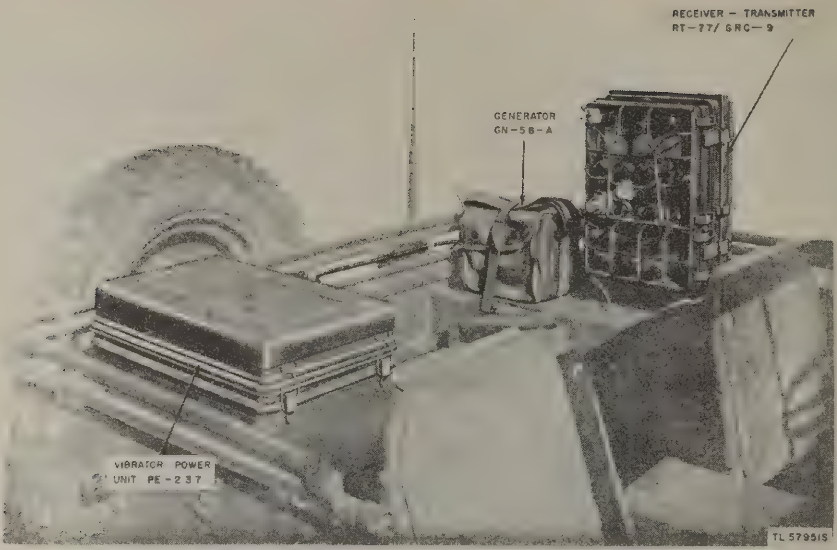


Figure 44. Typical vehicular installation of radio set AN/GRC-9.

instructions given in this manual (pars. 35, 36, and 37).

c. If possible, install Radio Set AN/GRC-9 in a vehicle having a 12-volt or 24-volt electrical system. Installation in vehicles having 6-volt systems should be avoided. since the high current drain at 6 volts makes it difficult to keep the vehicular storage battery charged.

d. A vehicle having an electrical system with negative ground must be used. The radio set will not operate properly in vehicles having positive grounded electrical systems.

e. A typical vehicular installation of Radio Set AN/GRC-9 is shown in figure 44.

35. Vehicular Installation of Receiver-Transmitter RT-77/GRC-9

a. Select a location in which the controls will be accessible to the operator, and which is close to the position chosen for the antenna.

b. Use Mounting MT-350/GRC-9 to support and shockmount the receiver-transmitter. Mounting MT-350/GRC-9 is fastened directly to a vertical surface in the vehicle, using the screws provided. If a horizontal surface is selected, install Mounting MT-350/GRC-9 on Frame FM-85 (Signal Corps stock No. 2Z4660-85), modified as shown in figure 45. Figure 46 shows the mounting and frame installed in a vehicle.

c. For transportation or storage, strap the receiver-transmitter in Mounting MT-350/GRC-9 with Panel Cover CW-109/GRC-9 secured over the face with the clamps (fig. 47). WHEN REMOVING THE PANEL COVER,

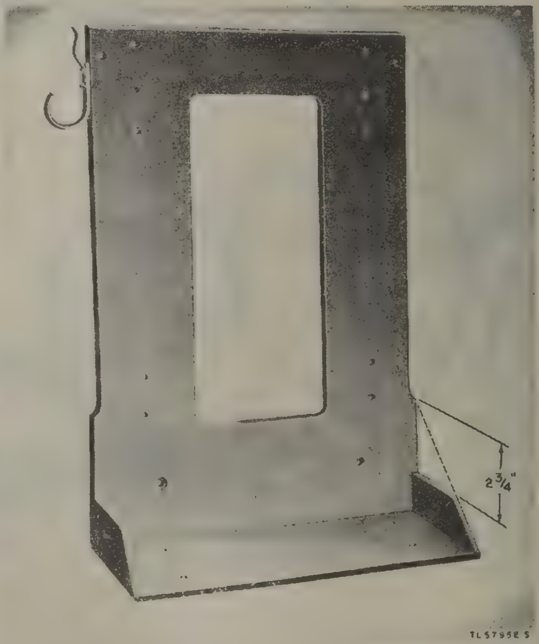


Figure 45. Frame FM-85, with gussets notched to accommodate mounting MT-350/GRC-9.

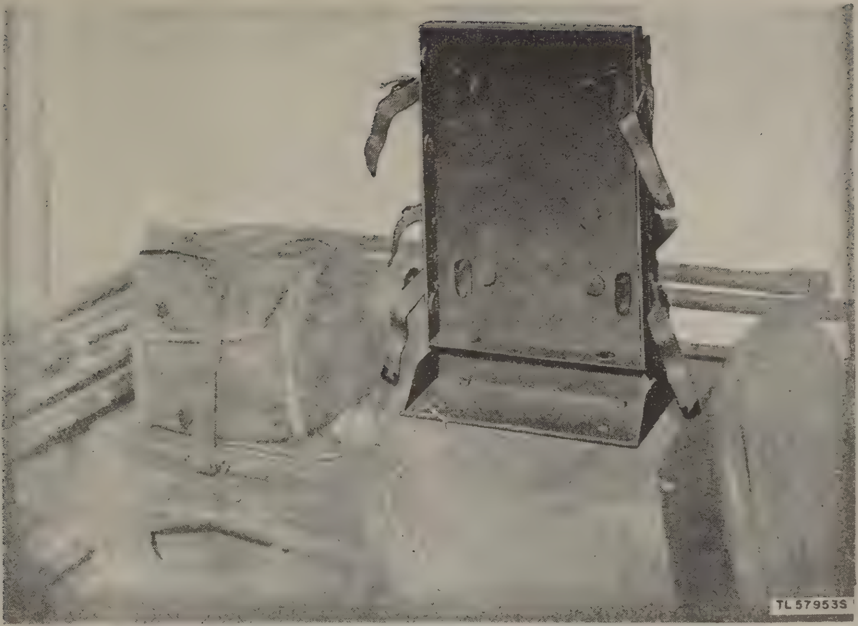


Figure 46. Mounting MT-350/GRC-9 and modified frame FM-85, installed in vehicle.

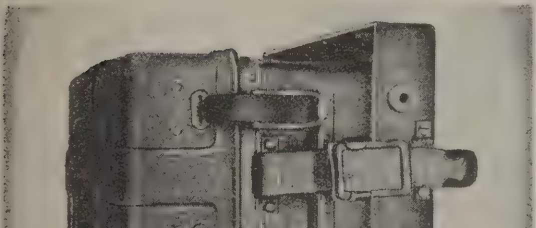


Figure 47. Receiver-Transmitter RT-77/GRC-9, mounted for vehicular transportation or storage.

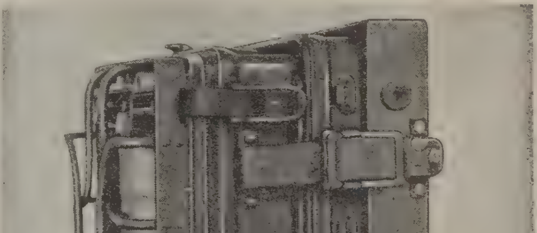


Figure 48. Receiver-Transmitter RT-77/GRC-9, mounted for vehicular use.

BE SURE TO REFASTEN THE CLAMPS TO SECURE THE RECEIVER-TRANSMITTER CHASSIS TO THE CASE.

d. For normal operation, place the cover between the receiver-transmitter and Mounting MT–350/GRC–9 (fig. 48). Secure the unit with the straps (fig. 48).

e. Connect a ground lead (as short as possible) from the GND. post on the receiver panel to a nearby grounded metal portion of the vehicle.

36. Installation of Vehicular Antenna

a. The vehicular antenna consists of Mast Base MP–65– and five mast sections (three Mast Sections MS–116–A, one Mast Section MS–117–A, and one Mast Section MS–118–A). Secure the antenna to the vehicle by means of a Mast Bracket MP–50 (Signal Corps stock No. 2A2090–50) or other appropriate brackets (fig. 49).

b. Select an antenna location close to the receiver-transmitter to permit a short antenna lead of Wire W–128. If possible, use a lead length of 19 inches or less. *Where this is not possible, lengths up to 6 feet may be used; however, for antenna leads between 19 inches and 6 feet, use 4 mast sections instead of 5 when operating on frequencies above 11 mc.* This is necessary to permit resonance of the transmitter at these upper frequencies when using a long antenna lead.

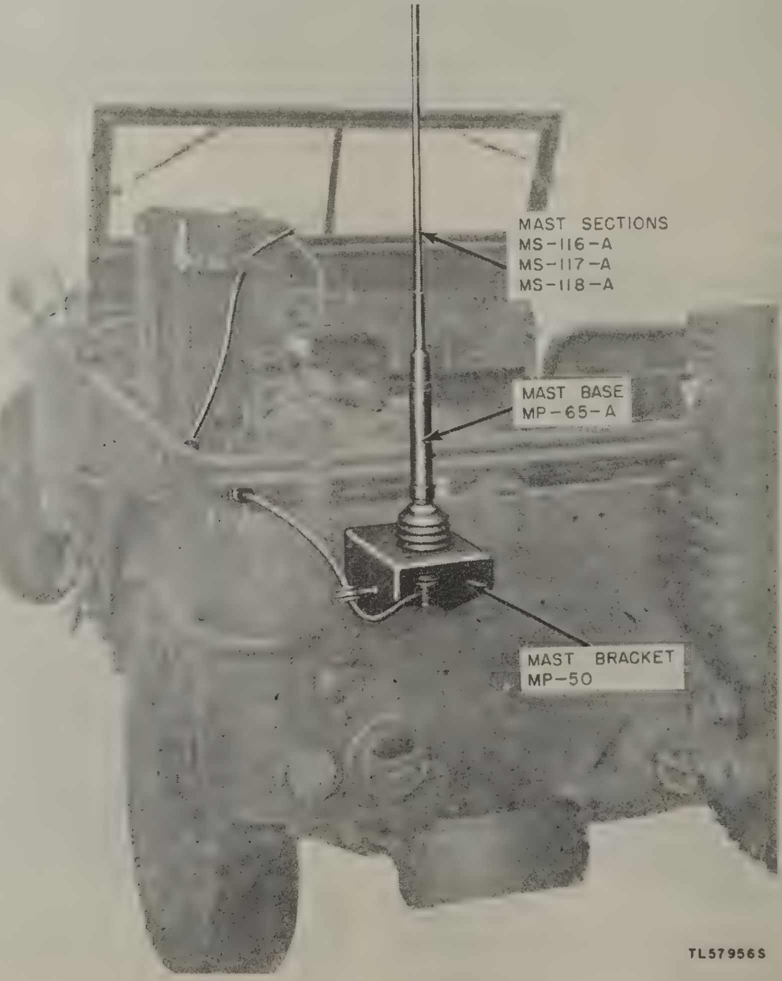


Figure 49. Typical installation of vehicular antenna of radio set AN/GRC–9.

c. Install the antenna.

(1) So that it is not shielded by adjacent metal.

(2) On a part of the vehicle strong enough to withstand the shock of trees or other obstacles which might hit the antenna.

d. Connect the antenna lead of Wire W–128 from the binding post on Mast Base MP–65–A to the upper antenna binding post on the transmitter marked ANT.

37. Vehicular Installation of Vibrator Power Unit PE–237

a. Bolt the power unit to a horizontal surface, leaving clearance to permit free movement of the power unit on its shockmounts. The location should be selected to permit the power cables to reach the vehicle power terminal box and to permit Cord CD–1086 to reach the receiver-transmitter.

b. Connect the power cables to the vehicle terminal box, making sure of the following:

(1) The negative (–) terminal of the vehicle storage battery is grounded to the vehicle frame. The set will not operate properly in vehicles with the positive battery terminal grounded.

(2) The negative lead of the power unit is connected to the grounded terminal in the vehicle terminal box.

(3) The input voltage setting of the power unit (par. 11) corresponds to the vehicular battery voltage.

c. Connect two short ground straps, one at each end of the power unit, from any of the bolts on the under side of the power unit to an adjacent grounded metal portion of the vehicle. This is to provide a direct low resistance path to ground for the unwanted r-f interference which vibrator power supplies are subject to generate.

d. Push the OFF button on the power unit, and connect Cord CD–1086 (3⅔ feet) between the power unit and receiver-transmitter. If the cord is not long enough, use Cord CD–1086 (7 feet), and secure it in a manner permitting ready removal for field use.

38. Service upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 24 for uncrating, unpacking, and checking the equipment.

b. Check the used or reconditioned equipment for tags or other indications pertaining to changes in the wiring or operation of the equipment. If any changes in wiring have been made, note the change in the appropriate section of this manual. Be sure to change the main schematic so that it agrees with the equipment received.

c. Check the operating controls for ease of rotation. If lubrication is required, refer to the lubrication instructions in chapter 3, section III.

d. Inspect all the cables for possible internal or external damage and repair those that might appear to give trouble later.

e. Perform the installation and connection procedures given in paragraphs 25 through 37 as required.

Section II. CONTROLS AND INSTRUMENTS

39. Transmitter section of Receiver-Transmitter RT–77/GRC–9

The following chart lists the controls of the transmitter section of Receiver-Transmitter RT–77/GRC–9 and indicates what they do. Figure 50 shows the front panel controls.

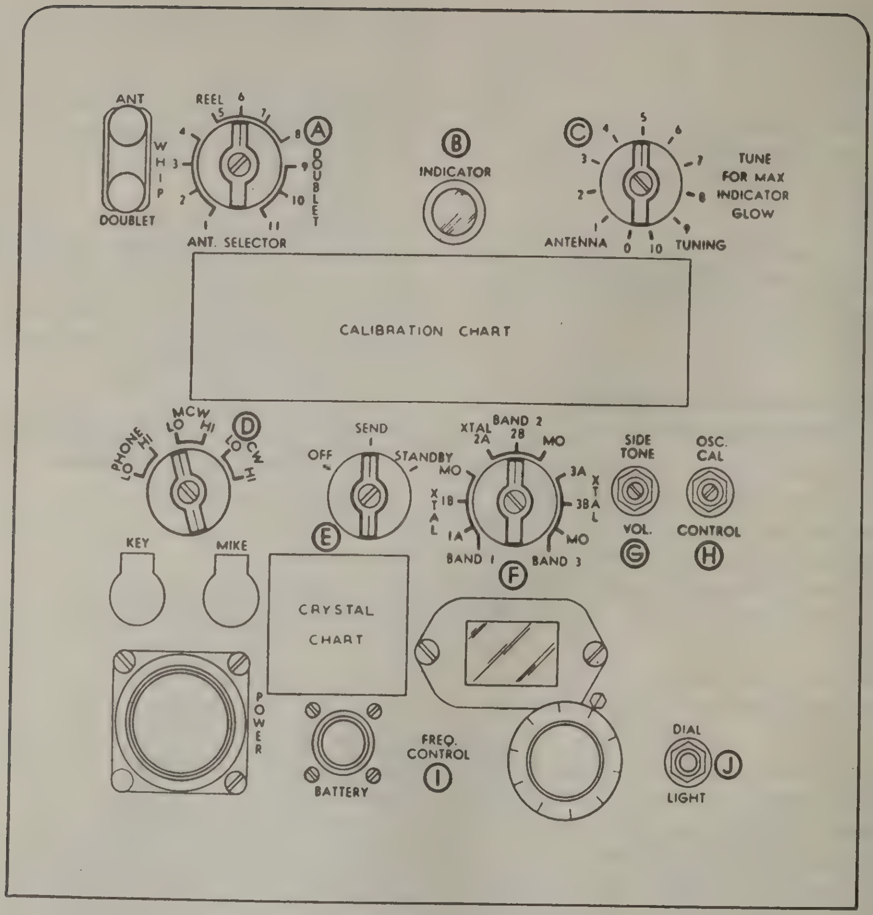

ANT
WHIP
DOUBLET
REEL
1 2 3 4 5 6 7 8 9 10 11
Ⓐ
DOUBLET
ANT. SELECTOR
Ⓑ
INDICATOR
Ⓒ
1 2 3 4 5 6 7 8 9
TUNE FOR MAX INDICATOR GLOW
ANTENNA
0
10
TUNING
CALIBRATION CHART
MCW
LO
HI
PHONE
LO
HI
CW
LO
HI
Ⓓ
SEND
OFF
STANDBY
Ⓔ
XTAL
BAND 2
2A
2B
MO
3A
XTAL
3B
MO
XTAL
1B
1A
MO
BAND 1
BAND 3
Ⓕ
SIDE TONE
VOL.
Ⓖ
OSC. CAL
CONTROL
Ⓗ
KEY
MIKE
CRYSTAL CHART
POWER
BATTERY
FREQ. CONTROL
Ⓘ
DIAL
LIGHT
Ⓙ

Figure 50. Transmitter controls.

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Panel letter	Control	Function
Ⓐ	ANT. SELECTOR dial switch (S102).	This switch is a multicontact switch which arranges the components in the output circuits of the final power amplifier so that any of the three available antennas connected will be properly tuned to resonance. Positions 1, 2, 3, and 4 match the power amplifier coil to a vertical mast or whip antenna to cover the frequency range of the transmitter. Positions 5, 6, 7, and 8 match the coil to an end-fed long-wire antenna, and positions 9, 10, and 11 match the coil to a center-fed or doublet antenna.
Ⓑ	INDICATOR (I101)	This control is a neon indicator bulb which is connected in the antenna matching circuit; it glows at its brightest level when the antenna is tuned to resonance with the transmitter signal. The bulb is located behind two circular Polaroid lenses; the inner one is stationary whereas the outer one can be rotated around an axis perpendicular to its center. When two red dots on the outer barrels of both lenses are lined up, these lenses will allow the maximum amount of light to penetrate through them. When the two red dots are 90° apart, the light emerging from the indicator bulb will not be allowed to penetrate the lenses. This system is a safety measure for blackout conditions.

Panel letter	Control	Function
Ⓒ	ANTENNA TUNING part of coils T110A and T110B.	This control adjusts the position of powdered iron cores which slide in and out of the antenna matching transformers T110A and T110B. When the proper position of these cores is found, the antenna will be tuned for the frequency of transmission desired and the INDICATOR (control Ⓑ) will glow with maximum brilliancy. Thus, the ANTENNA TUNING control is rotated until the neon indicator shows the brightest glow.
Ⓓ	PHONE–MCW–CW control S-105.	1. This switch is used to select any of the three types of transmission available on this radio set. *a.* PHONE: This position permits the transmission of voice signals, using a microphone which is inserted in the MIKE jack. *b.* MCW: In this position, the radio set transmits a signal of constant frequency depending on the tuning dial (control Ⓘ) position. This signal is modulated by a constant audio frequency which is generated by an audio oscillator located in the transmitter. The transmitter is keyed in the usual manner as for c-w signals. This system is also called tone modulation. With this system, the radio set receiving these signals need not have a bfo (beat-frequency oscillator) to make them audible, since they already are modulated and can be detected in the usual manner. *c.* CW: The signal is keyed by means of a key which is inserted in the KEY jack, and for reception, it requires that the station being sent to have a bfo. Otherwise the signal would be inaudible, as received. 2. Each of the three positions described has a HI and LO position also. In the HI position, the maximum power is available for transmission, while in the LO position, the transmitter output is greatly reduced so that operation over only short distance ranges is possible.
Ⓔ	OFF-SEND-STANDBY control S103.	This switch has three positions: 1. OFF: In this position, both the receiver and transmitter are not in operation. All power to both units is completely shut off. 2. SEND: This position is used when it is desired to transmit or receive signals. When the key is not depressed or the microphone press-to-talk switch is not pushed, only the receiver is supplied with voltage and receives signals. As soon as the key is depressed, relays in the transmitter switch the voltage from the receiver to the transmitter. The transmitter is automatically placed in operation and sends out the desired signal. 3. STANDBY: This position is used when Battery BA–48 or when Vibrator Power Unit PE–237 is supplying power. When the switch is turned to STANDBY, only the receiver is in operation. In this position, less power is needed to operate the radio set, so that during long periods of listening there will be less current drain on the battery.
Ⓕ	XTAL-MO-BAND switch S101.	This switch allows the operator to select either crystal control or master oscillator (MO) control of the transmitter on any of the three bands. The crystal portions of this control operate in conjunction with six Crystal Units CR–8B/U, inserted in sockets on the transmitter chassis. Each crystal operates at a particular frequency in the selected band.
Ⓖ	SIDE TONE VOL. potentiometer R115.	It is advantageous to have the operator of the radio set be able to listen to the voice and code signals which he is transmitting. This is especially important for code signals. A special arrangement in the transmitter feeds back to the receiver headset a sidetone signal from an audio oscillator circuit during keying operation. Each time the key is depressed, the oscillations are fed to the headset. For voice transmission, the audio signal from the output of the modulator stage is fed to the headset. The volume of this sidetone signal is adjusted by the SIDE TONE VOL. control. It has a slotted shaft which is turned with a screw driver.

Panel letter	Control	Function
Ⓗ	OSC. CAL. CONTROL variable capacitor C102.	This is another screw driver control which turns a small variable capacitor in the mo (master oscillator) circuit, and thus, varies the frequency between fine limits. The control is used in conjunction with the receiver 200-kc crystal calibrating circuit.
Ⓘ	FREQ. CONTROL variable capacitor C101.	The frequency control is the tuning adjustment for selecting the transmitting frequency. Transmitting frequencies with respect to dial calibration of the drum dial and tuning knob are shown on the calibration chart fastened to the front panel of the transmitter.
Ⓙ	DIAL LIGHT control S104__	This is a push-button switch which, when pressed, lights a small panel light in back of the transmitter dial thus illuminating it. The dial light will be illuminated only when Generator GN–58–(*) or Vibrator Power Unit PE–237 (SEND position) is used. Further, on PHONE position of control Ⓓ, the dial light can be lighted only when the key is depressed or the MIKE press-to-talk switch is closed.

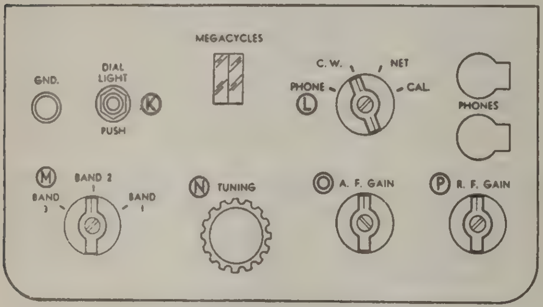

Figure 51. Receiver controls.

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40. Receiver Section of Receiver-Transmitter RT–77/GRC–9

The following table lists the controls of the receiver section of Receiver-Transmitter RT–77/GRC–9 and indicates what they do. The receiver controls are shown in figure 51.

Panel letter	Control	Function
Ⓚ	DIAL LIGHT PUSH control S2.	This is a push-button switch which, when pressed, lights a small panel light in back of the receiver dial, illuminating it.
Ⓛ	PHONE-C.W.-NET-CAL. switch S3.	The function of this switch is to select the type of operation desired and to check the dial calibration of the receiver. 1. PHONE: This position allows the reception of voice signals or mcw signals. The output is heard in the headset or the loudspeaker, either of which may be plugged into one of the two jacks marked PHONES. 2. C.W.: When placed on this position, c-w signals can be received. A bfo in the receiver beats with the incoming cw and an audio frequency beat note is heard in the headset. 3. NET: On NET position, it is possible to tune the transmitter to the frequency of any station in which it is desired to hold communication. Also, once the receiver dial calibration is known to be accurate, the transmitter-oscillator frequency can be adjusted (control Ⓗ) by matching it with the receiver dial calibration. In the NET position, the gain of the receiver is greatly reduced. 4. CAL.: A crystal-oscillator circuit in the receiver permits the dial calibration of the receiver. Frequency check points are available over the entire band at every 200 kc.
Ⓜ	BAND 3-BAND-2-BAND 1 switch S1.	This switch permits the selection of any of the three frequency bands available. BAND 3 is the lowest frequency range while BAND 1 is the highest. As the band switch is turned from one band to another, a mechanically coupled mask operates to cover the dial calibration of the unused frequency bands.

Panel letter	Control	Function
Ⓝ	TUNING capacitor C7	This knob tunes the radio receiver circuits and controls the operation of the calibrated dial which is viewed through the dial window. There are three dial scales. *a.* The lower scale on the dial is BAND 3 which covers the frequency range of 2.0 mc to 3.6 mc, with dial mark at each 20 kc. *b.* The middle scale on the dial is BAND 2, which covers the frequency range of 3.6 mc to 6.6 mc with dial marks at every 20 kc. *c.* The top scale is BAND 1 which covers the frequency range of 6.6 mc to 12.0 mc with dial marks at every 50 kc. A shutter exposes the portion of the dial being used and covers the unused scales by a mechanical connection to the band switch (control Ⓜ). A dial lock on the tuning knob allows the dial to be locked in a fixed position once it is set on the desired frequency.
Ⓞ	A. F. GAIN potentiometers R19A and R19B.	This is a volume control which varies the strength of the audio signal delivered to either the headset or the loudspeaker. The volume will be a minimum when this control is rotated to its furthest counterclockwise position.
Ⓟ	R. F. GAIN potentiometer R9	This control varies the d-c voltage on the screen grid of the first r-f amplifier, thus controlling the gain of this stage to prevent overloading of the following stages on strong signals. On all positions but NET of (control Ⓛ) the screen grid of tube V3 is also controlled by the R. F. GAIN control.
	IMPEDANCE switch S4	This switch is found in the back of the receiver and is used to match the output circuit of the receiver to headsets or Loudspeaker LS–7. Output loads of either 250 or 4,000 ohms impedance can be matched (fig. 39). The switch is adusted with a screw driver. For Loudspeaker LS–7, the switch is placed at 4,000 ohms.

41. Vibrator Power Unit PE–237

a. ON-OFF SWITCH. The main switch consists of a circuit breaker which is manually operated. The switch is operated by pressing the desired button. Both the ON and OFF buttons are covered with a watertight neoprene gasket (fig. 15).

b. VOLTAGE SELECTOR SWITCH. When the top cover of Vibrator Power Unit PE–237 is removed, the input operating voltage of the unit can be adjusted to 6, 12, or 24 volts to correspond with that of the vehicular battery used. To change from one operating voltage to another, it is necessary to raise the handle on the voltage change switch to release it from a locked position. When the cover is installed, the switch can be checked visually for correct voltage position by looking at it through the transparent window, which is provided for that purpose in the side of the vibrator case.

Section III. OPERATION OF POWER SUPPLIES UNDER USUAL CONDITIONS

42. Generator GN–58–(*)

The operator sits astride the leg seat and rotates the generator cranks in the direction indicated by the arrow, next to the crank opening in the side of the generator housing. Do not attempt to rotate the cranks in the reverse direction to that indicated by the arrow, or damage to the generator will be done, which will require a major repair. Satisfactory operation may be obtained if the cranks are turned at a speed from 50 to 70 rpm (revolutions per minute).

43. Vibrator Power Unit PE–237

a. Vehicular installation instructions are given in paragraph 37.

b. The operation of the vibrator unit is automatic, being controlled by relays in the unit which are connected to the OFF-SEND-STANDBY switch (control Ⓔ) on the transmitter.

Merely pressing the ON button contained in the vibrator unit will not start it operating. It is necessary for the transmitter OFF-SEND-STANDBY control to be in any position but OFF before Vibrator Power Unit PE–237 will begin to operate. Thus, if the transmitter is shut off, the vibrator also is shut off automatically. When the transmitter is turned to the SEND or STANDBY position, the vibrator is automatically turned on. Of course, this is only when the ON button on the vibrator first has been pressed in.

c. The ON-OFF switch on Vibrator Power Unit PE–237 is also a circuit breaker which will open the circuit if the vibrator starts to draw too much current from the vehicular battery for any reason. If this happens, it is necessary only to press the ON button and the unit will begin to operate. However, the transmitter must be turned to OFF before the vibrator button is pressed to ON. No damage will result if this is not done, but the ON button on the vibrator circuit breaker may fail to lock, while the transmitter control is at SEND.

Caution: Never hold the circuit breaker in the ON position. If the vibrator switch does not remain closed when the ON button is released (and the transmitter is at OFF), there is something wrong; an overload condition is present which requires investigation so that it can be removed.

d. To shut off the vibrator unit, press the OFF button. This action will make Vibrator Power Unit PE–237 independent of the transmitter OFF-SEND-STANDBY control, and regardless of the position of this control, the vibrator will remain OFF and no power will be supplied to the radio set.

44. Battery BA–48

This battery can be used to supply power to the receiver only. The transmitter cannot be operated from it. It is possible to use the battery in conjunction with the hand generator in which case both the receiver and transmitter can be operated. The battery will power the receiver, while the generator is turned only when it is desired to use the transmitter. With this arrangement, the generator does not require the usual full manual energy to turn since it powers only the transmitter. The OFF-SEND-STANDBY switch on the transmitter must be on STANDBY at all times during this system of operation.

Section IV. OPERATION OF RECEIVER UNDER USUAL CONDITIONS

45. Receiver Operation from Vibrator Power Unit PE–237

Check the voltage of the storage battery to be used. If the voltage does not agree with that shown on the drum dial as viewed through the window on the side of the vibrator case, remove the top cover of the vibrator power unit and pull up the knob of the voltage change switch. Set the pointer to the correct voltage. Reinstall the top cover. Then follow the succeeding steps:

a. Place switch Ⓛ at PHONE or C.W. depending on the type of transmission to be received.

b. Set switch Ⓜ for the frequency band to be used.

c. Turn controls Ⓞ and Ⓟ fully clockwise.

d. Insert plug of Cord CD–307–A and Headset HS–30–(*) in one of the PHONE jacks.

e. Press the ON button on the Vibrator Power Unit PE–237.

f. Turn control Ⓔ on transmitter to the STANDBY position.

(1) In the STANDBY position of control Ⓔ, the vibrator power unit supplies only the receiver. When it is desired to use the transmitter along with the receiver, control Ⓔ is turned to the SEND position.

(2) The steady hum of the vibrator in Vibrator Power Unit PE–237 should be clearly audible through the power unit housing.

g. Tune the receiver to the desired incoming signal by turning TUNING control Ⓝ.

h. Press the DIAL LIGHT push button to illuminate the tuning dial if operating in the dark.

i. If voice signals are to be received, lower the volume level by turning the A. F. GAIN control Ⓞ counterclockwise. When c-w signals are being received, adjust the R. F. GAIN control Ⓟ to the point where reception is most satisfactory.

j. The circuit of the receiver is designed so that if the headset is removed from the PHONE jack, the filaments of the receiver will automatically be shut off.

46. Receiver Operation from Generator GN–58–(*)

a. Turn OFF-SEND-STANDBY control Ⓔ on the transmitter to SEND. The generator will not supply power to the receiver if control Ⓔ is in any other position.

b. Except for steps *e* and *f* above, the operation of the receiver is the same as described in paragraph 45 above.

c. The generator should be turned at a speed of approximately 60 rpm, and it should be turned in the direction indicated by the arrow on the side of the generator housing.

d. If the turning of the generator is stopped, the receiver and the transmitter will no longer be supplied with power.

47. Receiver Operation from Battery BA–48

The battery will supply power to the receiver only and not to the transmitter. For this operation, perform the following steps:

a. Insert the female connector of Cord CD–1119 into the BATTERY receptacle on the transmitter panel and tighten the retaining ring.

b. Insert the male connector of Cord CD–1119 into the receptacle on the Battery BA–48.

c. Turn OFF-SEND-STANDBY control Ⓔ on the transmitter to the STANDBY position. The battery will not supply power in any other position of this switch.

d. Except for steps *e* and *f*, the operation of the receiver is the same as described in paragraph 45.

48. Receiver Operation from Generator GN–58–(*) and Battery BA–48

a. The radio set can be used with this combination, making it necessary to turn the cranks of the generator only when transmitting since the battery will operate the receiver. The generator will not supply any power to the receiver.

b. The OFF-SEND-STANDBY control Ⓔ must be on STANDBY for this type of operation.

c. The operation is the same as in paragraph 45, except that the generator must be turned only when transmission is desired.

49. Phone Operation and Net Operation

a. The PHONE position of control Ⓛ will allow the reception of voice and mcw signals.

b. The NET position allows the transmitter to be tuned exactly to any frequency which the receiver section is receiving. The NET position is not to be used for normal reception since, at this position, the sensitivity of the receiver is purposely reduced. NET position is to be used only in conjunction with the transmitter, when it is desired to place the receiver-transmitter in a radio communications group or net. For more detailed explanation see paragraph 56.

50. Receiver Calibration

This operation is a means to check whether the dial reading for tuning control Ⓝ actually gives the true frequency to which the receiver is tuned.

a. A 200-kc crystal installed in the receiver supplies a series of crystal-controlled check frequencies against which to check the calibration of the receiver and transmitter. These check frequencies are all harmonics of 200 kc. The calibration check points are 2,000 kc, 2,200 kc, 2,400 kc, and up to 12 mc, thus covering the entire band of the radio set. To check the calibration of the receiver dial, connect a pair of earphones to the receiver and proceed as follows:

(1) Turn control Ⓛ to CAL. (calibrate).
(2) When using Vibrator Power Unit PE–237 or Battery BA–48, turn control Ⓔ on the transmitter to STANDBY. When using Generator GN–58–(*), turn control Ⓔ to SEND.
(3) Turn control Ⓓ on the transmitter to PHONE. In the PHONE position, the filaments of all the transmitter tubes are not supplied with power and are inoperative unless the MIKE push button is pressed. This is a desirable

condition during the calibration operation, since the transmitter cannot interfere with the receiver.

(4) Turn the A. F. GAIN control Ⓞ to the maximum or greatest clockwise position.

(5) Turn the R. F. GAIN control Ⓟ to the minimum or greatest counterclockwise position.

(6) Turn control Ⓜ to BAND 3.

(7) Turn the TUNING KNOB Ⓢ to the lowest frequency check point (2.0 mc). Increase R. F. GAIN control Ⓟ slightly, until the signal is heard. Adjust the TUNING knob until zero beat is heard on the strongest beat note in the vicinity of the crystal check point. At this point, the receiver tuning circuits should be near the 2.0-mc dial.

(8) After checking the receiver calibration at 2,000 kc, proceed through the entire tuning range on BAND 3, checking the calibration every 200 k apart such as 2,200, 2,400, 2,600, an up to 3,600 c or 3.6 mc.

(9) Turn control Ⓜ to BAND 2 and tur control Ⓢ to 3.6 mc. Check calibratio points every 200 kc on BAND 2 up t 6.6 mc.

(10) Turn control Ⓜ to BAND 1 and tur control Ⓢ to 6.6 mc. Check calibratio points up to 12.0 mc.

(11) If the calibration is off enough t cause confusion, it may be correcte as described in chapter 6, section IV

b. If, during calibration, interference fron strong signals is being picked up, the antenn lead-in can be disconnected from the ANT. pos to avoid misleading beats.

51. Stopping Procedure

a. Turn control Ⓔ to the OFF position.

b. Stop cranking the hand generator or press the OFF button on the vibrator power unit.

Section V. OPERATION OF TRANSMITTER UNDER USUAL CONDITIONS

52. Transmitter Operation

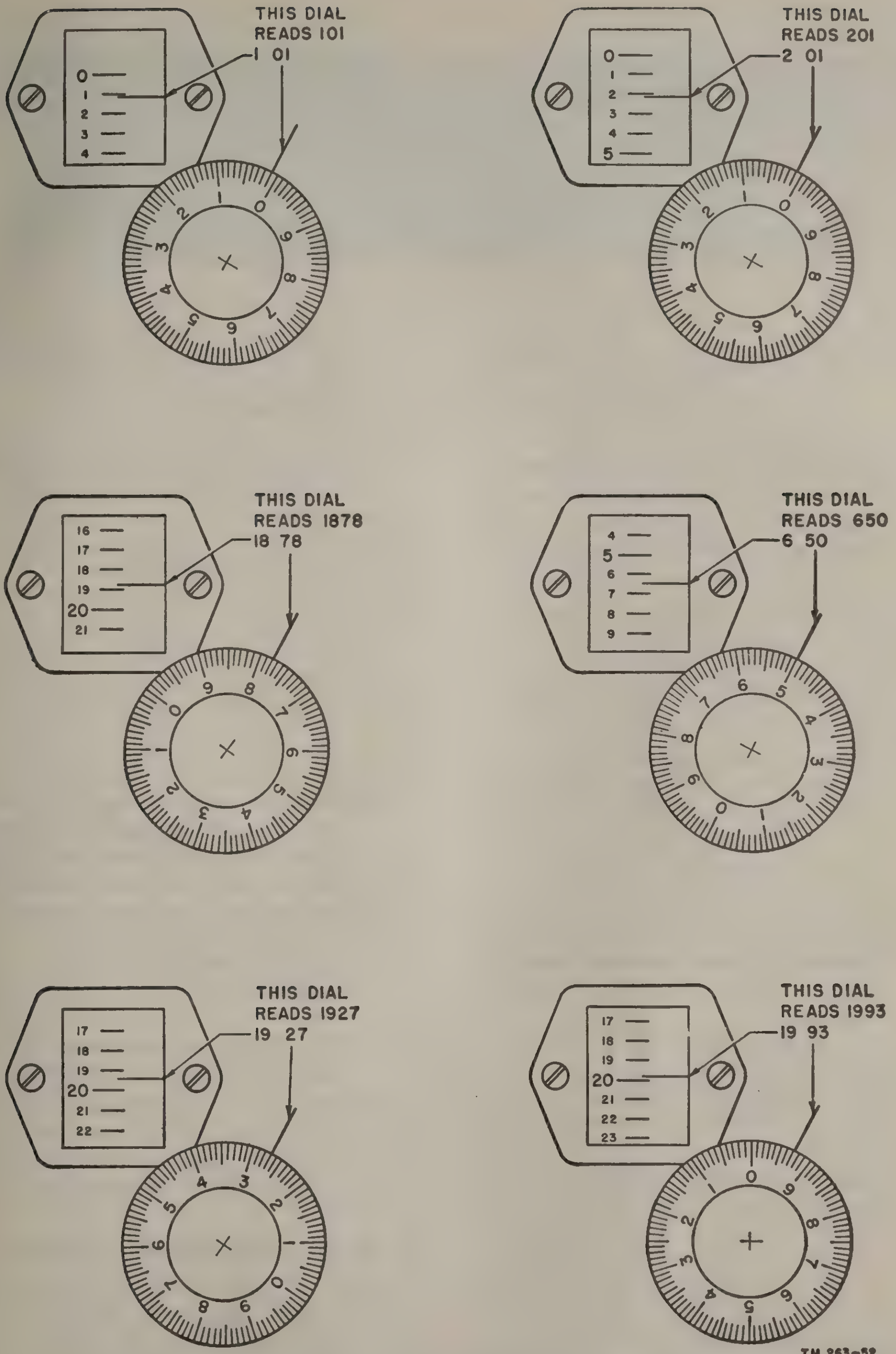
a. GENERAL. The transmitter functions only when the OFF-SEND-STANDBY control Ⓔ is on the SEND position. In this position, the receiver also may be used. Special circuits and relays in the transmitter determine which section of the receiver-transmitter will be placed in operation. When the key or the press-to-talk switch on the microphone is not depressed, the receiver automatically functions and receives all signals to which it is tuned. When the key or microphone switch is closed, power is supplied to the transmitter and removed from the receiver. The receiver ceases to function while the transmitter sends out the desired signal. Before the operations of the transmitter are described, the use of the transmitter dial and dial charts will be explained.

b. DIAL READING. The tuning dial control Ⓘ consists of two graduated scales; one scale is located behind a glass window and the other scale is marked around the edge of the tuning control knob. The numbers on both of these scales are taken as one reading and they determine the frequency to which the transmitter is tuned. The numbers are not the actual transmitting frequencies but are related to these frequencies by the chart on the transmitter panel. Several dial settings with the corresponding dial readings are shown in figure 52.

c. DIAL READING CALIBRATION CHART. On the transmitter panel is a dial reading calibration chart (fig. 53), which relates the different frequencies of transmission to the dial settings. This chart will not be the same on the different models of the transmitter. Each individual set must be tuned by the chart on its panel. Assume that it is desired to transmit on a frequency of 5,540 kc in BAND 2, refer to figure 53 and proceed as follows:

(1) Find 5,500 kc in the frequency column of the BAND 2 section. To the right on the same line as the 5,500 kc, there are 5 columns, each with headings of from +00 kc to +80 kc.

(2) Since the dial setting for 5,540 kc is wanted, the +40 kc column is the one referred to.


0
1
2
3
4
1
0
9
8
7
6
5
4
3
2
0
1
2
3
4
5
16
17
18
19
20
21
9
8
7
6
5
4
3
2
1
0
4
5
6
7
8
9
17
18
19
20
21
22
4
3
2
1
0
9
8
7
6
5
17
18
19
20
21
22
23
0
9
8
7
6
5
4
3
2
1
TM 263-52

THIS DIAL
READS 101
1 01

THIS DIAL
READS 201
2 01

THIS DIAL
READS 1878
18 78

THIS DIAL
READS 650
6 50

THIS DIAL
READS 1927
19 27

THIS DIAL
READS 1993
19 93

Figure 52. Transmitter dial readings.

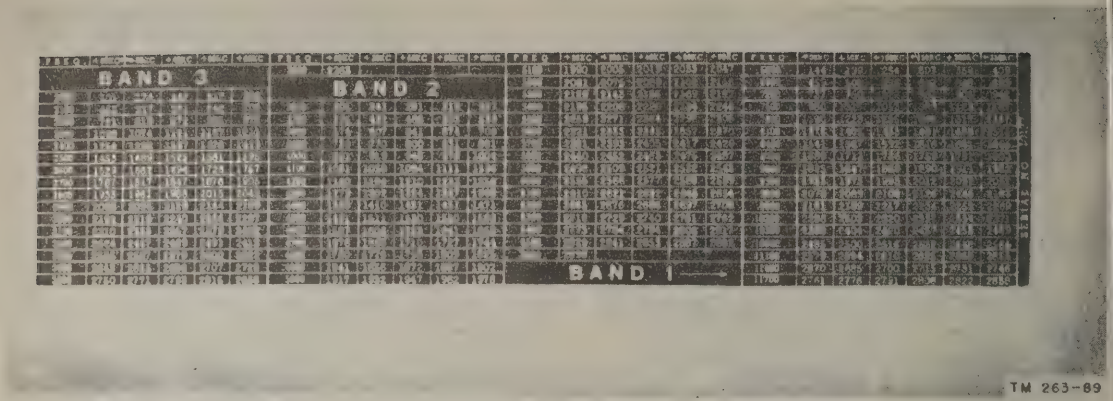


Figure 53. Transmitter dial calibration chart.

(3) In the small box where lines through 5,500 kc and +40 kc intersect, number 2284 is found. This is the number to which the dial should be set in order to transmit a frequency of 5,540 kc.

d. UNLISTED DIAL SETTINGS. Sometimes a frequency of transmission will be wanted that is between two listed dial settings on the chart; for instance, in BAND 1, 9,238.5 kc. The following interpolation is necessary:

(1) From the desired frequency (9238.5 kc), subtract the first calibrated frequency below it (9200 kc).

$$\begin{array}{r} 9238.5 \\ -9200 \\ \hline 38.5 \end{array}$$

(2) Find the difference between the dial readings for the frequencies listed just above and just below the desired frequency.

9250 kc has a dial reading of ---------- 1932
9200 kc has a dial reading of ---------- −1911
21

(3) Multiply the value obtained in step 1 above by that in step 2.

$$\begin{array}{r} 38.5 \\ \times 21 \\ \hline 385 \\ 770 \\ \hline 808.5 \end{array}$$

(4) Divide this answer obtained in step 3 above by 50 for BAND 1.

Note. When using any frequency in BAND 3 or BAND 2, divide the answer of step 3 by 20, not 50.

$$\begin{array}{r|l} & 16.17 \\ \hline 50 & 808.50 \\ & 50 \\ \hline & 308 \\ & 300 \\ \hline & 85 \\ & 50 \\ \hline & 350 \\ & 350 \\ \hline & 0 \end{array}$$

(5) Add the answer obtained in step 3 to the dial setting corresponding to the first calibrated frequency just below the desired frequency. This answer is the dial setting for the unlisted frequency.

Dial setting for 9200 kc is---------- 1911
Add ------------------ +16.17
1927.17

This 1927.17 corresponds to the desired frequency of 9238.5 kc.

(6) In the actual setting of the dial to this frequency, the dial numbers after the decimal point are not included. The dial setting is shown in figure 52.

53. Master Oscillator (MO) Operation

a. The oscillator section of the transmitter may be either crystal-controlled or a self-sustaining oscillator called a *master oscillator*. The mo can tune over the entire band, while the transmission frequencies with the crystal oscillator are fixed, depending on the frequencies of the crystals used. The crystal oscillator is more stable however and should be used when there is no necessity of changing rapidly from one frequency to another.

b. To transmit using the mo, proceed as follows:

(1) Connect the antenna, key, microphone, power cables, etc., according to paragraph 33.

(2) Set switch Ⓓ to PHONE, MCW, or CW, whichever type of transmission is desired. If low-power emission is desired for short distance range transmission, set the switch to the LO position for that type of transmission.

(3) Set control Ⓕ to the mo position for the desired frequency band.

(4) Adjust FREQ. CONTROL knob (control Ⓘ) to correspond with the transmitting frequency as shown on the calibration chart. If an unlisted frequency is used, interpolate (par. 52*d*) to obtain the correct dial setting.

Note. If there is any reason to believe that the transmitter is out of calibration, it can be checked and corrected as described in paragraph 55.

(5) Turn ANT. SELECTOR switch Ⓐ to the highest numbered position for the type of antenna being used.

(6) Turn the outer barrel of INDICATOR Ⓑ clockwise until the two red dots on the side of the barrel are in line.

(7) Turn switch Ⓔ to the SEND or STANDBY position, depending on the type of power supply being used.

  (*a*) Vibrator Power Unit PE–237 or Generator GN–58–(*) by itself; turn switch Ⓔ to SEND.

  (*b*) Generator GN–58–(*) in conjunction with Battery BA–48; turn switch Ⓔ to STANDBY.

(8) Turn control Ⓛ on the receiver to PHONE or C.W. position so that the sidetone can be heard.

(9) Depress the button on the microphone or close the key and rotate ANTENNA TUNING control Ⓒ until INDICATOR control Ⓑ glows at its maximum intensity. If the indicator does not glow through a complete sweep of knob Ⓒ, turn ANT. SELECTOR knob Ⓐ to the next lower number. Rotate knob Ⓒ again until maximum glow is seen. If there is still no glow, repeat with knob Ⓐ.

Note. If the indicator glows with more than one setting of knob Ⓐ, always use the highest numbered position of this switch at which the indicator will glow. When using a long-wire antenna, it is sometimes difficult to see any indication of resonance on INDICATOR Ⓑ when control Ⓒ is tuned through resonance. In that case, temporarily remove the antenna lead from the antenna binding post; adjust control Ⓒ to give maximum INDICATOR glow, then reconnect the antenna lead and proceed with normal operation. Be sure that the jumpers in the antenna are connected correctly for the selected frequency of operation, according to the instructions on the calibration chart attached to the antenna. When the antenna lead-in is reconnected, it will probably be necessary to readjust control Ⓒ for maximum brilliance.

Caution: When tuning for an indication of resonance, never leave the transmitter on in excess of 15 seconds with the antenna lead disconnected from the ANT. binding post.

(10) Adjust SIDE TONE VOL. control Ⓖ for desired volume.

c. To operate Microphone T–17, hold it close to the lips, press the button on the handle, and speak in a loud, clear voice. Hold the button until finished talking, then release the button to listen for the reply.

Note. About 2 seconds are required for the tubes to heat properly each time the button is pressed. Wait 2 seconds after pressing the button before talking. Always release the button *immediately* after transmitting, since no reply can be heard from the receiver with the button switch closed.

54. Crystal (XTAL) Operation

a. Positions have been provided for the installation of a total of six Crystal Units CR–8/U on the transmitter chassis. The installation of the crystal units is described in paragraph 31. In the crystal operation, only six frequencies of transmission are possible depending on the crystals inserted.

b. A frequency doubler circuit is incorporated in the transmitter; because of this, the transmission frequency will be twice the natural frequency of the crystal. Therefore, if it is desired to transmit on a frequency of approximately 3,000 kc in BAND 3, a crystal with natural frequency of 1,500 kc should be installed in the appropriate socket. Two crystal oscillator frequencies are available for each of the three bands. Either of the crystals in any one band maybe inserted in either of the two sockets available for that band. The crystal sockets are shown in figure 131. Therefore, the 1,500-kc crystal should be inserted in either socket 3A or 3B. The transmitted frequency (2X crystal frequency) with the corresponding dial setting for each of the six crystals, should be written on the small white chart on the transmitter panel.

c. For crystal operation, perform the following procedure:

(1) Connect the antenna, key, microphone, power cables, and headset to the receiver-transmitter.

(2) Set switch Ⓓ to PHONE, MCW, or CW, whichever type of transmission is desired. If low power emission for short distance is desired, set control Ⓓ to the LO position for that type of transmission selected.

(3) Set switch Ⓕ to the XTAL position for the frequency band selected.

(4) Adjust FREQ. CONTROL Ⓘ to the proper dial setting as indicated on the calibration chart, on which the transmission frequency (2X crystal frequency) with corresponding dial setting is recorded.

(5) Turn ANT. SELECTOR control Ⓐ to the highest numbered position for the type of antenna used.

(6) Turn the outer barrel of INDICATOR Ⓑ clockwise until the two red dots on the side of the barrel are in line.

(7) Turn switch Ⓔ to SEND or STANDBY, depending on the type of power supply being used. With Generator GN–58–(*) or Vibrator Power Unit PE–237, turn to the SEND position. Use the STANDBY position when Battery BA–48 is used in conjunction with Generator GN–58–(*).

(8) Turn control Ⓛ on the receiver to the PHONE or C.W. position.

(9) Depress the button on the microphone or close the key and rotate ANTENNA TUNING control Ⓒ until the indicato reaches its maximum glow. Follow th procedure outlined in paragraph 53*b* step 9.

(10) Adjust SIDE TONE VOL. control for desired volume.

55. Transmitter Calibration

It is important to know if the transmitter actually transmits on the frequencies corresponding to the dial settings on the calibration chart. Thus, if it is desired to send a signal of approximately 5,500 kc, the FREQ. CONTROL knob Ⓘ is set at the appropriated setting. When this setting is made, the calibration operation assures that the transmitter will send a signal of 5,500 kc. This is accomplished by first accurately tuning the receiver and then feeding a reduced signal output of the transmitter into the receiver. The procedure is as follows:

a. First calibrate the receiver as described in paragraph 50. The selected calibration frequency of the receiver must be some multiple of 200 kc, which is closest to the desired signal output of the transmitter. Assume that a transmitter signal of 5,835 kc is desired. The receiver should first be calibrated at 5,800 kc and not at 5,835 kc, because receiver calibration is accomplished by using the harmonics of a 200-kc crystal.

b. Turn control Ⓕ to MO for the band being used.

c. From the transmitter calibration chart, determine the dial setting corresponding to the calibration check frequency and turn FREQ. CONTROL knob Ⓘ to that dial setting.

d. Turn control Ⓛ on the receiver to the NET position.

e. Set control Ⓓ on the transmitter to MCW or CW. Do not set it to PHONE because calibration will be impossible in that position.

f. Turn control Ⓔ to SEND if Generator GN–58–(*) is used alone, or if Vibrator Power Unit PE–237 is used. Turn control Ⓔ to STANDBY if Battery BA–48 is used in conjunction with the hand generator.

g. Adjust A. F. GAIN control Ⓞ for the desired volume.

h. Adjust OSC. CAL. CONTROL Ⓗ with a screw driver until the beat note which is heard disappears, and a zero beat condition is obtained. This corrects the calibration for that particular frequency, and all other frequencies within that band also will be correct.

i. To restore the receiver to normal operation, turn control Ⓛ to C. W. or PHONE.

56. Net Operation

Net operation means that the transmitter sends out signals which are of the same frequency as those that the receiver is receiving. To make sure that the transmitter is tuned to the same frequency as the receiver, proceed as follows:

a. With Radio Set AN/GRC–9 set up for operation, turn switch Ⓔ to the SEND or STANDBY position depending on the power supply being used. Refer to paragraphs 45 through 48.

b. Receive the desired signal with receiver control Ⓛ on either PHONE or C.W. and lock the tuning dial at this frequency point.

c. Observe the frequency of the net control station and, referring to the transmitter calibration chart, adjust the transmitter FREQ. CONTROL dial Ⓘ to the approximate frequency.

Note: If an end-feed long-wire antenna is being used, make sure that the proper antenna jumpers are closed and that the transmitting antenna is matched to the transmitter.

d. Turn switch Ⓛ on the receiver to the NET position.

e. Turn switch Ⓓ on the transmitter to MCW or CW. Do not place switch Ⓓ on PHONE or it will be impossible to tune the transmitter to the receiver frequency.

f. With the earphones still connected to the receiver, tune the transmitter FREQ. CONTROL Ⓘ until the strongest beat note is heard in the headset.

g. Adjust FREQ. CONTROL Ⓘ on the transmitter until the beat note disappears and a condition of zero beat is obtained.

Caution: During the entire process of tuning the transmitter to the receiver, do not depress the key or microphone button because this will cause the transmitter to have full output, and the station which the receiver is receiving will be blocked out.

h. After the zero beat is found, lock the tuning knob of FREQ. CONTROL Ⓘ.

i. Turn control Ⓓ on the transmitter to PHONE, MCW, or CW, whichever type of transmission is desired.

j. Turn control Ⓛ on the receiver to PHONE or C. W., whichever type of reception is obtained from the other net stations.

57. Stopping Procedure

For any type of transmission or reception, the stopping procedure for the transmitter and receiver is exactly the same.

a. Turn control Ⓔ to the OFF position.

b. Stop cranking the hand generator and press the OFF switch on Vibrator Power Unit PE–237.

Section VI. OPERATION UNDER UNUSUAL CONDITIONS

58. General

The operation of Radio Set AN/GRC–9 may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs instructions are given on procedures for minimizing the effect of these unusual operating conditions.

59. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow:

a. Handle the equipment carefully.

b. Keep the equipment warm and dry. If the set is not in a heated inclosure, construct an insulated box for the set.

c. Heavy coatings of frost will gather on mouth-type microphones in extreme cold weather when the microphones are used in the open air or in a cold room. Frost will form from the breath in the small holes of the cap and will affect transmitter modulation. Rubber diaphragms have been designed to protect some types of microphones; use them when available. Have a spare microphone ready, if possible, in case the one in use fails to function properly.

d. Wear a knitted woolen cap over the earphones when operating in the open air with headsets that do not have rubber earpieces. Frequently, when headsets without rubber earpieces are worn, the edges of the ears may freeze without the operator being conscious of this condition. Never flex rubber earcaps, since this action may render them useless. If water gets into the phones, or if moisture condenses within them, it may freeze and impede the actuation of the diaphragm. When this happens, remove the bakelite cap and remove the ice and moisture from the earphone.

e. When equipment which has been exposed to the cold is brought into a warm room, it will start to sweat and will continue to do so until it reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. This condition also arises when the equipment warms up during the day after exposure during a cold night.

f. Use any improvised means to protect dry batteries, since they will fail if not protected against the cold. Preheat the batteries. To prevent heat loss, place them in bags lined with kapok, spun glass fiber materials, animal skins, or woolen clothing.

60. Operation in Tropical Climates

When operated in tropical climates, radio equipment may be installed in tents, huts, or, when necessary, in underground dugouts. When equipment is installed below ground and when it is set up in swampy areas, moisture conditions are more acute than normal in the tropics. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the temper ture of the equipment becomes lower than th ambient air. To minimize this condition, plac lighted electric bulbs under the equipment. B sure that the equipment is moisture-fung proofed.

61. Operation in Desert Climates

a. Conditions similar to those encountere in tropical climates often prevail in desert areas Use the same measures to insure proper opera tion of the equipment.

b. The main problem which arises wit equipment operation in desert areas is the larg amount of sand or dust and dirt which enters the moving parts of the equipment. The ideal preventive precaution is to house the equipment in a dustproof shelter. Since, however, such a building is seldom available and would require air conditioning, the next best precaution is to make the building in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors, cover the inside walls with heavy paper, and, with sand, secure the side walls of tents to prevent their flapping in the wind.

c. Never tie power cords, signal cords, or other wiring connections to either the inside or the outside of tents. Desert areas are subject to sudden wind squalls which may jerk the connections loose or break the lines.

d. Be careful to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks (par. 66). Pay particular attention to the lubrication of the equipment. Excessive amounts of dust, sand, or dirt that come into contact with oil and grease result in grit, which will damage the equipment.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

62. Tools Supplied with Radio Set AN/GRC–9

a. PULLER, TUBE; KELLEMS #11–16 (Signal Corps stock No. 6R7443–4). This is a tube puller for the small peanut tubes contained in the receiver-transmitter. It is located in Box BX–53–C. Its use is illustrated in figure 41.

b. PULLER, PILOT LAMP (Signal Corps stock No. 6Q36920–2). This is a puller for removing and replacing the small dial illuminating lights located behind the transmitter and receiver panels. It is located in Box BX–53–C and its use is illustrated in figure 40.

c. WRENCH, BRISTO NO. 6 (Signal Corps stock No. 6R55230). This wrench is located in Box BX–53–C.

d. WRENCH, BRISTO NO. 8 (Signal Corps stock No. 6R55231.1). This wrench is located in Box BX–53–C.

e. WRENCH, SETSCREW; ALLEN NO. 8. This wrench is located inside the case of Vibrator Power Unit PE–237. It is used to fit into a #8 Allen type socket headless setscrew and a #4 socket head cap screw. The knob on voltage change switch 735 has a socket head setscrew.

63. Special Tools

No special tools are required.

Section II. PREVENTIVE MAINTENANCE SERVICES

64. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that break-downs and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. See TM 38–650.

65. General Preventive Maintenance Techniques

a. Use #0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with Solvent, dry-cleaning (SD); then wipe the parts dry with a cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 P.S.I. to remove dust from inaccessible places; be careful, however, or mechanical damage from the air blast may result.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

e. Whenever a loose connection is tightened, it should be moisture-fungiproofed by applying the varnish with a small brush.

66. Performing Preventime Maintenance

The following preventive maintenance operations should be performed by organizational personnel at the intervals indicated, unless these intervals are reduced by the local commander.

Caution: Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

DAILY

1. Cabinets.

(*a*) Inspect and clean the outside of each cabinet thoroughly with a clean dry cloth. Use dry compressed air to blow out all accumulated dust and dirt. Repaint any surface which is scratched, rusted, or chipped. Tighten all mounting bolts, panel screws, plugs, and control knobs found loose.

(*b*) Inspect the glass dial covers for cracks and breaks and replace if necessary.

(*c*) See that the INDICATOR control Ⓑ Polaroid glass shields are securely mounted on the panel.

(*d*) Correct the legibility of the writing on the CRYSTALS calibration chart.

(*e*) See that the panel lights operate on both the receiver and transmitter when the unit again is assembled ready to operate.

2. Antenna components.

(*a*) Check that the antenna insulating supports are clean. The threaded portions of the whip mast sections should be cleaned and freed from any green scale which usually collects on copper exposed to the air.

(*b*) Any breaks in the long-wire antenna should be carefully spliced and soldered. Guy cords and halyards should be inspected.

3. Cords and cables. The condition of the cabling must be observed closely.

(*a*) Inspect cables for cracked or deteriorated insulation, frayed or cut insulation at connecting and supporting points, and improper placement which strains cables or connections. Also watch for kinks.

(*b*) Clean connections on cables when they are dirty or corroded. Clean corroded connectors with #0000 sandpaper. Clean entire surface of connector, but do not make any attempt to remove individual prongs from cable plugs.

4. Headsets, microphone, and key.

(*a*) Inspect cords and see that they are not kinked, cut, or abraded.

(*b*) See that Plugs PL–55 and PL–68 are bright and clean.

(*c*) Check that the key does not bind and can be manipulated at normal speed. Clean the contacts with #0000 sandpaper if they are blackened or corroded.

WEEKLY

Caution: Disconnect all power to the receiver-transmitter before performing the following operations. Upon completion, reconnect power and check for satisfactory operation.

1. Cabinets and chassis. Clean interior of receiver-transmitter cabinet, exterior of the chassis, and all parts accessible without removal from chassis.

2. Tubes.

Note. Do not work on tubes immediately after shut-down. Severe burns may result from contact with the hot envelopes.

(*a*) Inspect glass and metal tube envelopes, tube cap

WEEKLY—Continued

on tube type 2E22, and tube bases for cracks and a cumulation of dirt and corrosion. Tubes with loose pla cap or envelopes should be replaced, if possible.

(*b*) Examine spring clip on tube type 2E22 plate c for loss of tension, corrosion, and faulty contact to t connecting lead.

(*c*) Inspect firmness of tubes in their sockets. Pre them firmly, but gently, straight down in their socket Do not jiggle the tubes from side to side as this ma break the pins or spread the contacts of the socket. I spect tube sockets at times when removal of the tub is required.

(*d*) Tubes operated at high voltage, such as tube typ 2E22 with exposed plate connections, should be kep extraordinarily free from dirt and dust to prevent leak age of current from the plate cap to the chassis. Remov dirt and dust from glass or metal envelopes with a clean lint-free, dry cloth. If the proper care is used, the plat cap may be cleaned with a piece of #0000 sandpaper b wrapping the paper around the cap and gently rubbin the surface. Excessive pressure is not needed. Wipe th cap with a clean dry cloth.

3. Gears. Inspect the teeth on the gears of the antenna coil T–110A and T–110B tuning slug assembly. Check the antibacklash gear on the receiver tuning shaft. If the gears are dirty, clean them with a small brush dipped in dry-cleaning solvent (SD).

4. Headsets, microphone, and key. Clean telephone type Plugs PL–55 and PL–68 with Polish, Metal Paste, Signal Corps stock No. 6G1516. After cleaning, remove all traces of polish on the plugs.

5. Coils. Inspect all coils for the cleanliness of the coil forms and, if dirty, clean the coils and coil forms with a soft brush. Tighten any coil mounting studs and resolder any leads which are loose.

6. Vibrator Power Unit PE–237.

(*a*) Remove cover and see that all components are securely screwed down to the chassis.

(*b*) Check the tightness of the clamp nuts which connect the battery cables to Vibrator Power Unit PE–237.

(*c*) See that the spade lugs on the output terminal board strip are securely screwed down.

(d) Check that Vibrators VB–1 and VB–16 and tubes 1005 and 1006 are correctly seated in their sockets.

(*e*) Check that the voltage change switch viewing window is not cracked or broken.

MONTHLY

1. Receiver-Transmitter. Remove all cover plates exposing under side of both chassis.

(*a*) *Resistors.* Inspect all resistors for blistering, discoloration, and other signs of overheating. Inspect the coating of the cement-coated resistors for signs of cracks and chipping. Inspect all leads but be careful not to move resistors with delicate pigtail leads or these leads may break at the point where they enter the resistor body. Resistors with discolored bodies indicate they are overloaded and there may be circuit trouble which requires analysis and correction.

Note. When fungiproofed resistors are heated, a harmless brown stain may appear.

(*b*) *Capacitors.* Inspect terminals of the large fixed capacitors for corrosion and loose connections. Carefully inspect mountings to discover loose mounting screws, studs, or brackets. Examine leads for poor insulation, cracks, and evidences of dry rot. Cut away frayed strands on insulation. If wire is exposed, wrap it with friction tape. See that the terminals of capacitors are not cracked or broken.

(1) Thoroughly inspect the case of each large fixed capacitor for leaks, bulges, and discoloration.

(2) Inspect the plates of the variable capacitors for dirt, dust, or lint. Examine the movable set of plates for signs of damage or misalinement that causes them to touch the fixed plates while tuning. Rotate the movable plates, using the panel tuning control. Listen and feel for any scraping or scratching which may occur.

Caution: Do not bend any plates of the tunable capacitors.

(3) Clean the case of fixed capacitors, the insulating bushings, and all connections that are dirty or corroded. Capacitor cases and bushings can usually be cleaned with a dry cloth. However, if the deposit of dirt is hard to remove, moisten cloth in solvent (SD).

(4) Clean plates of variable capacitors with a small brush or pipe cleaner, removing all dust and lint. Dust, if present, may cause arcing.

(*c*) *Switches.* (1) Inspect the mechanical action of each switch. Look for signs of dirt or corrosion on all exposed elements of the switch.

(2) Examine the ganged switches to see that their shafts are lubricated properly and that the electrical contacts are clean. The inspection is visual. Do not pry the leaves of the switch apart. The rotary members should make good contact with the stationary members, and as the former slides into the latter, a spreading of the stationary contact leaves should be noticed.

(3) Clean the exterior surfaces of switches with a stiff brush moistened with solvent (SD).

(*d*) *Relays and circuit breakers.* The relays in the receiver-transmitter, hand generator, and vibrator power supply are considered normal if the exterior is free from dirt or dust, the contacts are not burned, pitted, or corroded, the contacts are lined up and spaced correctly, the moving parts travel freely and function properly, the connections to the relay are tight, the wire insulation is not frayed or torn, the relay assembly is securely mounted, and the field coil shows no signs of overheating.

(1) Examine the contacts of the relays with the aid of a flashlight.

(2) Tighten all loose connections and mounting screws, but do not apply enough force to damage the screw or break the parts they hold.

(3) Brush the exterior with a soft brush. If it is very dirty, clean it with a brush dipped in solvent (SD). If loose connections are found, they should be corrected. If they are dirty or corroded, remove, clean, and replace them carefully.

(4) When it is necessary to clean the contact surfaces, burnish them with a clean blade of the contact burnishing tool. Place the blade between the contacts, press the contacts together, and move the blade back and forth. If the contacts require additional cleaning, apply carbon tetrachloride with a toothpick and again burnish with a clean blade of a burnishing tool. Remove all traces of white film formed by carbon tetrachloride.

(*e*) *Insulators.* The insulators are constructed of ceramic material with a glazed surface. Any deposit of foreign substance on the surface of this insulator will materially reduce its insulating value. Therefore, it is necessary to inspect the insulator frequently.

(1) Inspect the physical condition of the insulator. It should be clean without cracks or chips. It is possible for a highly glazed insulator to develop fine-line surface cracks where moisture and dust will accumulate and eventually form a leakage path.

(2) If an insulator is loose, tighten it but do not exert excessive pressure, or damage is certain to occur. The insulator may not fail at that time but when the high voltage is impressed across it, it may fail with serious consequences.

(3) If the insulators are dirty, they can easily be cleaned. Never use abrasive materials; the glazed finish will be destroyed. A clean cloth is usually satisfactory. If deposits of grime or dirt on the surface are hard to remove, use solvent (SD). After the surface has been cleaned with a solvent, polish with a dry cloth. Otherwise, a thin film of the solvent will be left which will impair the effectiveness of the insulator.

2. Vibrator Power Unit PE–237.

(*a*) For field maintenance the vibrator power unit shall not be further disassembled than just removing the top cover, unless definite repairs are necessary, and then only in a depot maintenance center. In this case, refer to chapter 6.

(*b*) Check each of the metal boxes located on the top of the chassis for excessive heating, discoloration, or bulging. These boxes contain transformers and fixed capacitors. Some heat is normal but excessive heat may require that further inspection is necessary. Refer to chapter 6.

3. Generator GN–58–(*).

(*a*) The generator is not to be further disassembled than removing the top part of the generator housing, unless definite repairs are necessary. In this case, refer to chapter 6.

(*b*) For field maintenance, the following is all that should be done.

(1) Inspect the brushes and the commutators at regular intervals. The brushes should be long enough to make firm contact with the commutator. The brush springs must have adequate tension and be in firm contact with the brushes. The commutators must be clean and smooth.

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(2) Press a piece of canvas folded to the exact width of the commutator against the commutator and turn the armature by hand.

(3) If the commutator has been burned or pitted, hold a piece of #0000 sandpaper against the commutator and turn it by hand.

(4) If necessary, a cloth moistened in carbon tetrachloride may be used to remove caked dirt and grease.

(5) Polish the commutator with a piece of canvas, as in step (2) above, and wipe with a clean, dry cloth.

(6) Feel and inspect all of the capacitors and resistors which are accessible. There should be no overheating or discoloration.

Section III. LUBRICATION

Note. There is no lubrication order (LO) for this equipment. Lubrication operations will be performed in accordance with the following instructions.

67. Approved Lubricants for Radio Set AN/GRC–9

a. LUBRICATING MATERIALS. The following table lists the lubricating materials necessary in servicing Radio Set AN/GRC–9:

Symbols	*Standard Nomenclature*
OE–10	Oil, engine
PL–Special	Oil, lubricating, preservative, special
GL	Grease, lubricating, special

b. PRELIMINARY LUBRICATION INSTRUCTIONS.

(1) Do not use excessive amounts of grease or oil and do not allow electrical contacts to become greasy.

(2) Make certain that lubricants and points to be lubricated are clean and free from sand, grit, or dirt. These abrasives are the chief causes of bearing wear and often necessitate bearing replacements.

(3) Use solvent (SD) to clean all parts. Before lubrication, wipe clean all surfaces to be lubricated; use a lint-free cloth dampened with solvent (SD). Keep solvent off surrounding parts.

(4) GASOLINE WILL NOT BE USED AS A CLEANING FLUID FOR ANY PURPOSE.

68. Lubricating Instructions for Receiver-Transmitter RT–77/GRC–9

a. Each month, clean the exposed bearing surfaces of switch detent surfaces, hinges, and fasteners, and sparingly apply oil (PL-Special). Remove excess oil to prevent possible malfunctioning. Be sure to keep the switch contacts free of all oil and grease.

b. Each month, clean exposed surfaces of antenna tuning slug drive gears, receiver and transmitter tuning capacitor drive gears, and apply to the gear teeth grease (GL). Avoid an excess of grease.

69. Generator GN–58–(*) Lubrication At First and Second Echelons

On the very early models, where oilite bearings were not used, apply a few drops of oil (OE–10) or oil (PL-Special) every 3 months. Apply the oil to the handcrank bearings at the sides of the generator case. DO NOT LOOSEN ANY OF THE SEALED SCREWS OF THE WATERPROOF CASE.

70. Generator GN–58–(*) Lubrication at Third or Higher Echelons

When Generator GN–58–(*) is disassembled for general overhaul or repairs, lubricate as follows:

a. Clean old grease and oil from the lubricated parts with solvent (SD). Invert the generator, when cleaning, so that the solvent does not flow into the commutator or armature windings.

b. Relubricate with grease (GL) during reassembly, or after the unit is assembled. Spread the grease evenly and avoid an excess of grease which cannot adhere to the greased mechanism.

71. Lubrication under Unusual Conditions

a. ARCTIC REGIONS. Lubricants which are satisfactory at moderate temperatures stiffen and solidify at subzero temperatures; as a result, moving parts bind or become inoperative. When preparing equipment for low-temperature operation, see that lubricants used for moderate temperatures are thoroughly removed. Even small amounts of such lubricants, if allowed to remain, may impair the operation of moving parts. Be sure to use the lubricant specified for low-temperature operation.

b. TROPICAL REGIONS. High temperatures and moisture due to rain, condensation, etc., may cause lubricants which are normally satisfactory to flow from moving parts and other surfaces. These bearing surfaces will wear excessively, and hinges, fasteners, and other parts will be damaged or destroyed by rust and corrosion. Inspect the equipment daily and lubricate it as required to insure efficient operation, using lubricants suitable for high temperatures.

c. DESERT REGIONS. Dust and sand infiltration into the equipment causes grit in the lubricants and will seriously impair and damage the moving parts of the set. Hot dry temperatures cause the lubricants to flow from the moving parts, and conditions similar to those described in *b* above occur. Use lubricants suitable for high temperatures. Inspect and clean the equipment daily.

Section IV. WEATHERPROOFING

72. Weatherproofing

a. GENERAL. Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. TROPICAL MAINTENANCE. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are fully explained in TB SIG 66.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

e. LUBRICATION. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat. Refer to section III of this chapter for detailed instructions.

73. Rustproofing and Painting

a. When the finish on the case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use #00 or #000 sandpaper to clean the surface down to the bare metal. Obtain a bright, smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften the rust, and sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

Section V. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

74. Scope

a. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued and by the existing tactical situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining such troubles as burned-out tubes, cracked insulators, etc.

b. The following paragraphs in this section help in determining which of the components, such as the receiver-transmitter or power supplies, are at fault and in localizing the fault in that component to the defective stage or item, such as a tube or relay.

75. Visual Inspection

a. Failure of this equipment to operate properly will usually be caused by one or more of the following faults.

(1) Improperly connected battery cable Cord CD–1119 or generator Cord CD–1086.
(2) Worn, broken, or disconnected cords or plugs.
(3) Antenna lead-in improperly connected to ANT. binding post.
(4) Receiver-transmitter interconnecting cable not connected properly, defective.
(5) Defective tubes or crystals.
(6) Loose or broken internal wiring.
(7) Dirty or broken switch contacts.

b. When failure is encountered and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred.

c. Visually inspect the antenna system for obvious abnormalities.

76. System Sectionalization of Trouble to a Component

System sectionalization is the tracing of a fault to a particular component of Radio Set AN/GRC–9 responsible for the abnormal operation of the set. By carefully observing the performance of the receiver and transmitter when the equipment is in operation the fault can often be determined immediately as either a transmitter, receiver, or power supply fault.

a. Operate the radio set and observe its performance. Refer to the equipment performance checklist (par. 77) for normal operating conditions.

b. If neither the transmitter nor the receiver works, try the two panel lights. If these do not operate, the trouble, most likely, is in the power supply being used.

c. If either the receiver or the transmitter works, but not both, the trouble is probably in the section that does not work. Although with this condition, the power cables may be at fault.

d. If the receiver exhibits unsatisfactory performance such as excessive noise, howling, or weak signals, replace it with a good receiver, if obtainable. If the trouble disappears, the replaced receiver is defective. If the trouble persists, it is probably not in the receivers but is either in the vehicle or due to conditions external to the vehicle.

e. If removal of the antenna causes the symptoms to become less pronounced or to disappear entirely, the trouble is in the antenna or is external to the antenna.

f. By the use of procedures similar to the simple checks given above, the trouble can be isolated to a particular unit.

77. Trouble Shooting by Using Equipment Performance Checklist

a. GENERAL. The equipment performance checklist (*e* below) will help the operator to determine if Radio Set AN/GRC–9 is functioning properly. The checklist gives the item to be checked, the normal indications of correct operation, and the corrective measures that the operator can take. Items 1 through 18 are checked before starting, items 19 through 21 when starting, items 22 through 31 during operation, and items 32 and 33 when stopping. *To use this list, follow the items in numerical sequence.*

b. ACTION OR CONDITION. For some items, this column gives the conditions and switch settings under which the item is to be checked. For other items, this column states what must be done to the item to check for normal indications given in the next column.

c. NORMAL INDICATIONS. The normal indications listed include the visible and audible signs that the operator should perceive when he checks the item. If the indications are not normal, the operator should apply the recommended corrective measures.

d. CORRECTIVE MEASURES. The corrective measures listed are those the operator can make without turning in the equipment for repairs. A reference in the table to chapter 6 indicates that the trouble cannot be corrected during operation and that trouble shooting by an experienced repairman is necessary. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

Note. The operator must familiarize himself with the radio set so that he can immediately recognize any changes in the normal operating characteristics and apply simple corrective measures when possible. By becoming familiar with the operation of the receiver, for example, the operator will know the normal position of the A. F. GAIN control for a particular station, and this knowledge will aid in determining the normal sensitivity and amplification of the receiver.

e. EQUIPMENT PERFORMANCE CHECKLIST.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	Antennas AT–101/GRC–9, AT–102/GRC–9.	Lead-in wire connected to ANT. binding post on transmitter.		
	2	Counterpoises CP–12, CP–13.	Counterpoise lead connected to GND. binding post on receiver.		
	3	Cord CD–1086	Connect female connector to POWER receptacle and make connection to power source (Vibrator Power Unit PE–237 or Generator GN–58–(*)).		
	4	Cord CD–1119	When using radio set with Battery BA–48, connect cord to BATTERY receptacle on transmitter panel.		
	5	Headset HS–30–(*)	Headset plug set completely into either of the PHONES jacks on receiver panel.		
	6	Key J–45, Microphone T–17, or T–45.	Key plugged into KEY jack and microphone plugged into MIKE jack.		
	7	PHONE MCW–CW control Ⓓ.	Set to any of the three types of transmission available.		
	8	OFF-SEND-STANDBY control Ⓔ.	Set to OFF position.		
	9	BAND control Ⓕ	Set to the frequency band desired and place on either MO or XTAL for that band.		
	10	PHONE-C.W.-NET-CAL. control Ⓛ.	Set to PHONE or C.W., whichever type of reception is desired.		
	11	BAND switch control Ⓜ.	Set to the frequency band of reception desired.		
	12	A.F. GAIN control control Ⓞ.	Set to approximate midpoint of its range.		
	13	R. F. GAIN control Ⓟ.	Set to approximate midpoint of its range.		

e. EQUIPMENT PERFORMANCE CHECKLIST—Continued

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	14	INDICATOR control Ⓡ. Vibrator Power Unit PE–237.	Set two red dots in line with each other.		
	15	ON-OFF button	Press OFF button.		
	16	Voltage change switch.	Set to proper input voltage to correspond to vehicle battery voltage (par. 41).		
	17	Battery lead-in cables.	Connect the two battery cables to the vehicle battery; 6, 12, or 24 volts, negative grounded. Pay attention to the polarity of the leads.		
	18	Power output receptacle.	Plug the male connector of Cord CD–1086 into the power output receptacle.		
START	19	OFF-SEND-STANDBY control Ⓔ.	Set to SEND when using Vibrator Power Unit PE–237 or Generator GN–58–(*). Turn to STANDBY when using Battery BA–48.		
	20	OFF-ON switch on Vibrator Power Unit PE–237.	Press ON button	Loud hum is heard from inside vibrator housing. Panel lights illuminated when DIAL LIGHT push buttons are pressed.	Check voltage change switch position. Check power Cord CD–1086. See that the headset plug is fully inserted in the PHONES jack. Trouble shooting necessary (ch. 6).
	21	A.F. GAIN control Ⓞ.	Turn clockwise	Background noises or signals heard in headset.	Phone plug must be completely inserted in PHONES jack. Receiver-transmitter interconnecting cable must be fully inserted. Check position of IMPEDANCE matching switch, S4, in back of receiver chassis. The handkey or microphone push-button switch may be shorted, keeping the transmitter in operation, thus not allowing the receiver to operate. Check or replace the voltage regulating tube V104 (VR–105) in the transmitter.

e. EQUIPMENT PERFORMANCE CHECKLIST—Continued

Item No.	Item	Action or condition	Normal indications	Corrective measures
22	FREQ. CONTROL Ⓘ.	Set to frequency of transmission desired.	Dial behind window does not turn.	Release dial lock.
23	ANT. SELECTOR control Ⓐ and ANTENNA TUNING control Ⓒ.	Set to proper positions as explained in paragraph 53*b*(9) and close the handkey.	INDICATOR Ⓑ glows	Tighten knob setscrew. Set two red dots on INDICATOR in line. When using long-wire antenna, see that the correct jumpers are closed. Make sure that the neon indicator lamp is not broken.
24	Key J–45	PHONE-MCW-CW switch Ⓓ at CW position.	When key is depressed, relay clicks are heard from the transmitter.	See that the key plug is fully inserted in KEY jack. Check power cable connections.
			INDICATOR Ⓑ glows	Set two red dots on INDICATOR Ⓑ line.
			Sidetone should be heard in Headset HS–30–(*).	Adjust SIDE TONE VOL. control Ⓖ. See that receiver-transmitter interconnecting cable is in good condition and is connected. See that the headset plug is fully inserted in the PHONES jack.
25	Microphone T–17 or T–45 (voice operation).	PHONE-MCW-CW switch Ⓓ set at PHONE. Press the microphone push button.	When microphone push button is pressed, relay clicks are heard in the transmitter.	Check microphone plug and switch. Check power cables.
			INDICATOR Ⓑ glows	Check two red dots on INDICATOR Ⓓ.
			The voice sidetone is heard in Headset HS–30–(*).	Inspect interconnecting cable for receiver-transmitter. Check modulator tube V105 (3A4).
			When push button is released, the transmitter panel light will not operate. This is normal for the PHONE position of control Ⓓ.	If dial light goes on when control Ⓙ is pressed and microphone pushbutton is released, refer to chapter 6.
26	PHONE-C.W.-NET-CAL. switch Ⓛ.	Turn to PHONE	Voice signals should be heard in Headset HS–30–(*). Mcw signals also can be heard.	See that antenna lead-in is connected. Headset plug should be fully inserted in PHONES jack. When using Generator GN–58–(*) alone, control Ⓔ must be at SEND position. See chapter 6.
		Turn to C.W.	It should be possible to hear c-w code signals.	Same as for PHONE.
				If phone signals were heard in the PHONE

e. EQUIPMENT PERFORMANCE CHECKLIST—Continued

Item No.	Item	Action or condition	Normal indications	Corrective measures
				position of control and no c-w signals the C.W. positi, check the bfo tube (1R5).
		Turn to NET	Voice, mcw, or c-w signals should be heard at reduced volume. No sidetone should be audible.	Trouble shooting is n essary. See chapter
		Turn to CAL. and turn TUNING control Ⓝ to a frequency which is a multiple of 200 kc. Turn control Ⓓ on transmitter to PHONE.	Unless the receiver is accurately calibrated a beat note should be heard. If the receiver is accurately calibrated, a beat note should be heard on either side of the dial setting, but exactly at the dial setting the beat note disappears and no note is heard in the headset.	Check that the 200- crystal in the receiv is fully inserted ar not broken. If c-w si nals were heard i the C. W. position c control Ⓛ and no bea note on CAL., chec the second i-f (inter mediate - frequency amplifier tube V (1R5), or replace th 200-kc crystal. Se chapter 6 for troubl shooting.
27	A. F. GAIN control Ⓞ.	With a signal tuned in, rotate control Ⓞ clockwise and counterwise. Switch control Ⓛ on PHONE or C.W. position.	The intensity of sound in the phones or loudspeaker should increase for the clockwise direction and decrease for the counterclockwise direction.	See chapter 6 for trouble shooting.
28	R. F. GAIN control Ⓟ.	With a signal in the headset, rotate control Ⓟ clockwise and counterclockwise. Switch control Ⓛ on PHONE or C. W. position.	Same as item 27	See chapter 6 for trouble shooting.
29	TUNING control Ⓝ.	Set to desired frequency of reception.	Dial behind window should turn.	Tighten setscrew on knob.
			Different stations should be received as the dial is turned.	Check converter tube V2 (1R5). See chapter 6.
			Only one station should be heard at a particular point on the dial.	See that the correct antenna jumpers are closed.
				Check converter tube V2 (1R5), if only a few stations are heard, at greatly reduced volume.
30	Generator GN–58–(*) used without Battery BA–48.	OFF-SEND-STANDBY switch Ⓔ placed on SEND. PHONE-C.W.-NET-CAL. switch Ⓛ placed on PHONE or C.W.	With the key up, noise or signals should be heard in the receiver headset.	Assuming that the receiver-transmitter is in perfect condition:

e. EQUIPMENT PERFORMANCE CHECKLIST—Continued

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE			Turn generator hand cranks at approximately 60 rpm.	Transmitter and receiver panel lights should light when controls Ⓙ and Ⓚ are pressed with key down.	Turn generator in the direction indicated by the arrow on the side of the generator housing at a speed approximately 60 rpm. See that Cord CD–1086 is properly connected. Check the brushes riding on the commutators and see that the springs have the correct tension. Replace the vibrator regulator unit in the generator.
	31	Generator GN–58–(*) used with Battery BA–48.	OFF-SEND-STANDBY switch to STANDBY. Turn hand generator. Press key down.	Assuming that the antenna circuits are properly tuned, INDICATOR Ⓑ should light. Sidetone should be heard in receiver headset.	Battery BA–48 supplies the plate power to the low power transmitter tubes. If the transmitter does not operate, change the battery. Check Cord CD–1119. If the receiver does not operate when the key is released, change the battery. The generator does not supply power to the receiver in STANDBY position of control Ⓔ.
STOP	32	OFF-SEND-STANDBY control Ⓔ.	Turn to OFF---- ---	Vibrator stops in Vibrator Power Unit PE–237.	Press OFF button on Vibrator Power Unit PE–237. If trouble shooting is necessary, see chapter 6.
	33	ON-OFF button on Vibrator Power Unit PE–237.	Press OFF -------------	Receiver or transmitter will not operate regardless of position of any of the receiver-transmitter controls. This is normal when the OFF button on Vibrator Power Unit PE–237 is pressed.	See chapter 6.
	34	Generator GN–58–(*).	If the hand generator is being used, turn OFF-SEND-STANDBY control to OFF. Stop turning the hand cranks.	Panel lights will no longer light and the receiver - transmitter will be inoperative.	

CHAPTER 4

AUXILIARY EQUIPMENT

78. Power Unit PE–162–(*)
(fig. 54)

a. This power unit is used for operation of both the receiver and transmitter. It is a lightweight gasoline-engine-driven generator of a manual starting type, having an electrical output of 150 watts at d-c voltages of 6.2 and 500 volts. The components of this unit include Engine GE–12–(*), Generator GN–50–(*), and Filter FL–43–A. The weight of this unit, when packed for export, is 125 pounds with a volume of 5 cubic feet.

b. The gasoline engine is a single-cylinder, two-cycle, air-cooled type, having a fuel tank capacity of one-half gallon. It is rated at 1 horsepower for a speed of 3,000 rpm.

Caution: Operation of this unit must not be attempted until the instructions given in TM 11–971 have been read and understood. The unit may be completely ruined unless the proper procedure is followed.

c. When using Power Unit PE–162–(*) with Radio Set AN/GRC–9, it is necessary to connect the generator to the radio set by means of Cord CX–75/TRC–2. No wiring changes are necessary in the cords or plugs to operate the radio set when using this power supply. When using Power Unit PE–162–(*), operation of the radio set, with respect to control settings, is the same as when using Vibrator Power Unit PE–237.

79. Reference Data

Complete data on the B model of this equipment is given in TM 11–971.

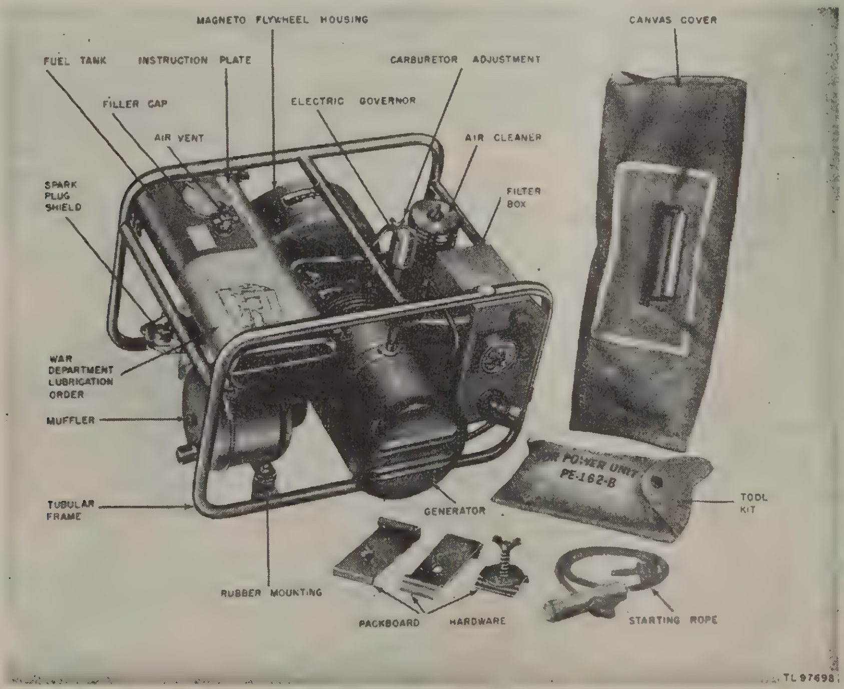

MAGNETO FLYWHEEL HOUSING
CANVAS COVER
FUEL TANK
INSTRUCTION PLATE
CARBURETOR ADJUSTMENT
FILLER CAP
ELECTRIC GOVERNOR
AIR VENT
AIR CLEANER
SPARK PLUG SHIELD
FILTER BOX
WAR DEPARTMENT LUBRICATION ORDER
MUFFLER
POWER UNIT PE-162-B
TUBULAR FRAME
GENERATOR
TOOL KIT
RUBBER MOUNTING
PACKBOARD
HARDWARE
STARTING ROPE
TL 97698

Figure 54. Power unit PE–162–B and equipment.

CHAPTER 5

THEORY

Section I. THEORY OF RECEIVER SECTION OF RADIO SET AN/GRC-9

80. Block Diagram

(fig. 55)

a. General. The receiver section of Receiver-Transmitter RT–77/GRC–9 consists of a 7-tube superheterodyne receiver designed for the reception of c-w and a-m signals over a frequency range of from 2.0 to 12.0 mc. Three bands are used to cover this range; band 1 covers from 6.6 to 12.0 mc, band 2 covers from 3.6 to 6.6 mc, and band 3 covers from 2.0 to 3.6 mc. The block diagram (fig. 55) shows the signal path through the receiver. A complete schematic diagram is shown in figure 138. The same antenna is used for transmitting and receiving; switching between the two sections is accomplished by a relay in the transmitter, which is operated by the key or press-to-talk switch on the microphone.

b. First R-F Amplifier. The signal is fed from the antenna to the tuned r-f amplifier V1. The r-f amplifier not only increases the signal voltage, but serves to isolate the oscillator section of tube V2 from the antenna, and also stops unwanted signals from entering the converter.

c. Converter. The signal then is fed to the mixer section of the combination mixer and oscillator tube V2. The oscillator section of tube V2 produces an h-f oscillator voltage which is 456 kc higher than the signal frequency. This voltage is combined with the received signal in the mixer section of tube V2 to produce a difference beat frequency of 456 kc which is then amplified by the i-f tubes, V3 and V4.

d. I-F Amplifier. The i-f amplifier is a high-gain circuit which is permanently tuned to the frequency difference between the h-f oscillator and the incoming r-f signal, and is thus a constant, single-frequency amplifier, operating on 456 kc. Most of the signal amplification occurs in tube stages V3 and V4.

e. Detector and First A-F Amplifier. The amplified signal is fed to the detector tube, V5, for demodulation. V5 is a dual tube, which serves as a detector and a first a-f (audio-frequency) amplifier. The detector stage also produces the avc (automatic volume control) voltage which is used to control the bias voltage on the grids of tubes V3 and V1. A bfo tube, V7, is used in conjunction with the detector stage for the reception of unmodulated c-w signals. After demodulation, the signal is fed to the other part of V5, the first a-f amplifier, where it is further amplified and then applied to the final a-f power amplifier V6.

f. Final Audio Power Amplifier. The output of the power amplifier V6 is applied across an impedance matching output transformer which permits headset or loudspeaker loads of 250 or 4,000 ohms impedance to be connected to the set.

g. Crystal Oscillator Calibrator. Tube V4 is used as a crystal oscillator in addition to serving as a second i-f amplifier. A 200-kc crystal is installed in the set and operates in conjunction with V4 to generate harmonics of 200 kc which are fed back to the control grid of V1. These harmonics are used to check the dial calibration of the receiver.

h. Beat-Frequency Oscillator. The bfo, tube V7 (tube type 1R5), is a circuit designed to allow the operator of the set to hear unmodulated c-w signals. The bfo generates a signal of 228 kc, whose second harmonic, 456 kc, is used to beat against the incoming i-f signal. If the receiver tuning dial is slightly detuned, the bfo harmonic will then beat against the i-f signal and produce an audible beat note which is passed on to the a-f amplifiers and can be heard in the headset. The pitch of the note is dependent on the amount of detuning.

i. Sidetone Monitor. When the transmitter

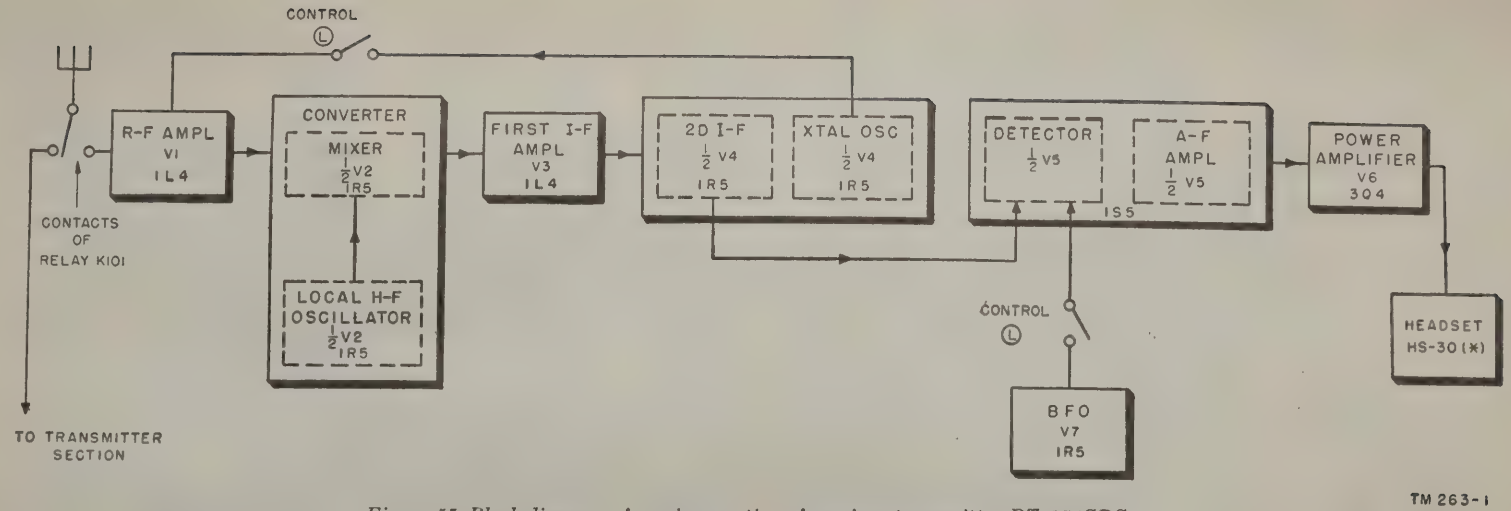

CONTROL
L
R-F AMPL
V1
1L4
CONTACTS
OF
RELAY K101
TO TRANSMITTER
SECTION
CONVERTER
MIXER
½V2
1R5
LOCAL H-F
OSCILLATOR
½V2
1R5
FIRST I-F
AMPL
V3
1L4
2D I-F
½ V4
1R5
XTAL OSC
½ V4
1R5
DETECTOR
½ V5
A-F
AMPL
½ V5
1S5
CONTROL
L
BFO
V7
1R5
POWER
AMPLIFIER
V6
3Q4
HEADSET
HS-30(*)
TM 263-1

Figure 55. Block diagram of receiver section of receiver-transmitter RT-77/GRC-9.

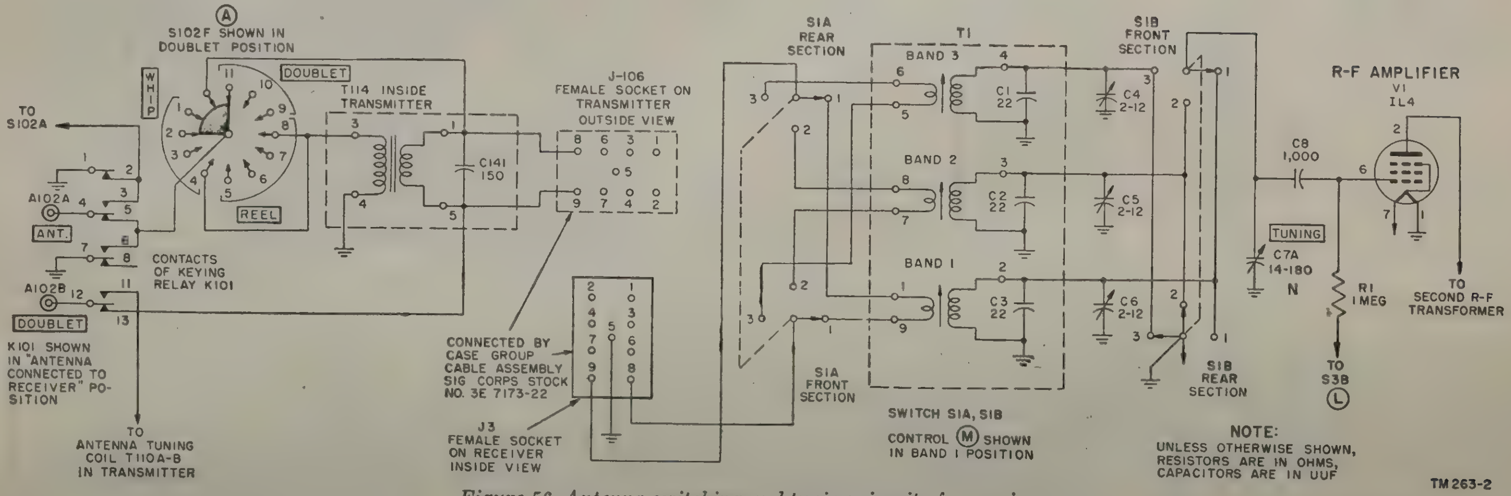

A
S102F SHOWN IN
DOUBLET POSITION
WHIP
DOUBLET
REEL
TO
S102A
A102A
ANT.
A102B
DOUBLET
CONTACTS
OF KEYING
RELAY K101
K101 SHOWN
IN "ANTENNA
CONNECTED TO
RECEIVER" PO-
SITION
TO
ANTENNA TUNING
COIL T110A-B
IN TRANSMITTER
T114 INSIDE
TRANSMITTER
C141
150
J-106
FEMALE SOCKET ON
TRANSMITTER
OUTSIDE VIEW
CONNECTED BY
CASE GROUP
CABLE ASSEMBLY
SIG CORPS STOCK
NO. 3E 7173-22
J3
FEMALE SOCKET
ON RECEIVER
INSIDE VIEW
S1A
REAR
SECTION
S1A
FRONT
SECTION
T1
BAND 3
BAND 2
BAND 1
C1
22
C2
22
C3
22
C4
2-12
C5
2-12
C6
2-12
S1B
FRONT
SECTION
S1B
REAR
SECTION
SWITCH S1A, S1B
CONTROL M SHOWN
IN BAND 1 POSITION
TUNING
C7A
14-180
N
C8
1,000
R1
1MEG
TO
S3B
L
R-F AMPLIFIER
V1
1L4
TO
SECOND R-F
TRANSFORMER
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TM 263-2

Figure 56. Antenna switching and tuning circuits for receiver.

is in operation, a portion of the transmitter modulation is fed to the receiver audio output transformer so that the intelligence going out from the transmitter can be heard in the receiver headset and thus monitored.

81. Antenna Switching and Tuning Circuits
(fig. 56)

a. A vertical mast (whip), long-wire, or doublet antenna may be selected by means of the terminals in the upper left-hand corner of the transmitter. The signal is picked up by the antenna and is fed to the contacts of keying relay K101. The relay is controlled by both the transmitter key and the press-to-talk switch on the microphone, and automatically connects the antenna to the transmitter when either of these s operated. The antenna is connected to the receiver at all times that the key or microphone s not in use. Receiver operation only will be described in this section.

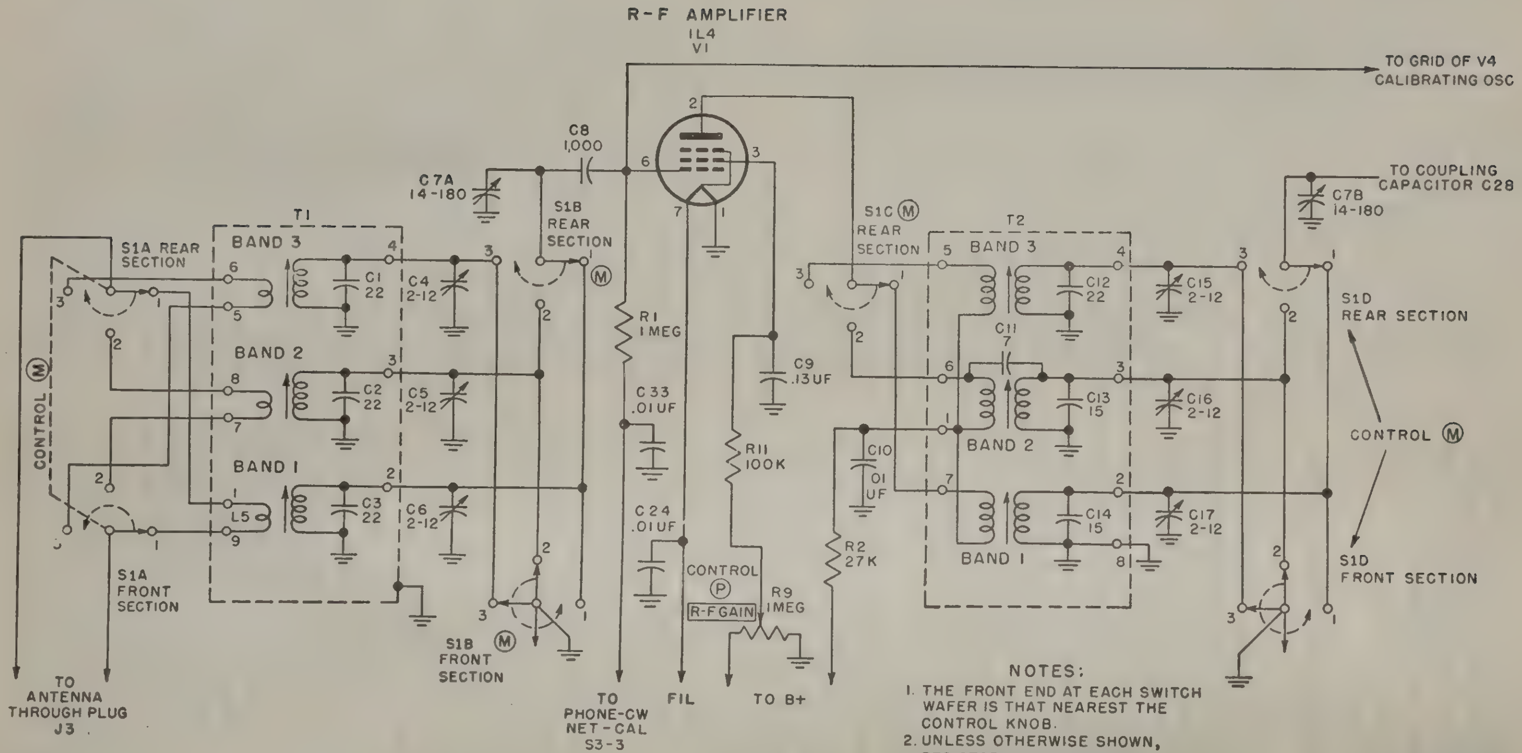
b. The signal leaves the relay contacts and s fed to control Ⓐ, antenna selector switch S102F, which connects the antenna to the matching transformer, T114. Transformer T114 s located inside the transmitter cabinet. When a doublet is used, it is connected to the ANT. and DOUBLET binding posts. With antenna selector switch Ⓐ in DOUBLET positions 9, 10, or 11, the doublet antenna is connected across the secondary of transformer T114. The impedance of the doublet should be from 50 to 72 ohms for a proper match. When a mast or long antenna is used, it is connected to the ANT. binding post. With antenna selector switch Ⓐ in WHIP positions 1, 2, 3, and 4, or REEL positions 5, 6, 7, and 8, the antenna is connected to the primary of transformer T114.

c. From T114, the signal is fed to female plug J106 on the transmitter and is connected to the receiver female plug by means of a cable with male plugs on both ends. The female plug J3 on the receiver is connected through switch S1A to antenna transformer T1 which contains three tuned circuits used to tune the antenna to resonance. Switch S1A is a 3-position band change switch, marked Ⓜ on the receiver panel, which applies the signal to the proper tuned circuit for the band selected. Each switch *wafer* is actually in two sections: The section nearest the control knob is denoted as the front section (fig. 56), while the section behind it or furthest from the knob is the rear section.

d. Considering only band 1, capacitor C3 is inside of transformer T1 and is part of the total tuning capacity. C3 is a temperature compensating capacitor. Capacitor C6 is the antenna trimmer and is used to adjust the h-f end of band 1. These two capacitors in conjunction with Ⓢ tuning capacitor C7A (antenna section of the receiver gang) are in parallel, and they tune the input circuit to resonance with the incoming signal. The lower end of band 1 is adjusted by varying the position of the transformer iron core slug. The selected r-f signal in the resonant secondary circuit is coupled to the control grid of r-f amplifier V1 by the coupling capacitor C8. Capacitor C8 isolates the control grid d-c bias voltage of tube V1 from the tuning circuit. Switch S1B is a double-section switch, having a front and a rear part. The front section selects the output of the tuning circuit which is being used. The rear section of switch S1B shorts to ground the two unused secondaries of transformer T1.

82. R-F Amplifier V1
(fig. 57)

a. The first stage of the receiver section is an r-f amplifier which uses tube type 1L4. Resistor R1 is the grid resistor across which the selected signal voltage is applied. In addition, this resistor permits the application of the avc voltage, but does not allow the currents to be shorted to ground through the avc filter capacitor C33. The amplified output of V1 is coupled through band change switch S1C to the second r-f transformer T2. The secondary of T2 is tuned by tuning capacitor C7B. Considering only band 1, capacitor C7B works in conjunction with trimmer C17 and fixed capacitor C14. Capacitor C9 bypasses the screen-dropping resistors so that r-f currents will not flow through these resistors and cause degeneration. Resistor R2 is the plate-dropping resistor and it is bypassed by capacitor C10 so that r-f will not flow into the d-c supply. The screen grid voltage of tube V1 is used as a means to control the r-f gain. This screen voltage is obtained across variable resistor R9, control Ⓟ R.F. GAIN, and is fed through screen-dropping resistor R11 to the screen grid.


R-F AMPLIFIER
1L4
V1
TO GRID OF V4
CALIBRATING OSC
C8
1,000
C7A
14-180
T1
S1B
REAR
SECTION
M
S1A REAR
SECTION
BAND 3
BAND 2
BAND 1
C1
22
C2
22
C3
22
C4
2-12
C5
2-12
C6
2-12
L5
CONTROL M
S1A
FRONT
SECTION
S1B M
FRONT
SECTION
TO
ANTENNA
THROUGH PLUG
J3
R1
1MEG
C 33
.01UF
C 24
.01UF
TO
PHONE-CW
NET-CAL
S3-3
FIL
CONTROL
P
R-F GAIN
R9
1MEG
TO B+
R11
100K
C9
.13UF
S1C M
REAR
SECTION
R2
27K
C10
.01
UF
T2
C11
7
C12
22
C13
15
C14
15
C15
2-12
C16
2-12
C17
2-12
C7B
14-180
TO COUPLING
CAPACITOR C28
S1D
REAR SECTION
CONTROL M
S1D
FRONT SECTION

NOTES:
1. THE FRONT END AT EACH SWITCH WAFER IS THAT NEAREST THE CONTROL KNOB.
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 57. R-f amplifier, simplified schematic.

b. The signal leaves T2 and enters band switch S1D, front section, from which it is then coupled, by means of capacitor C28, to the control grid of converter tube V2.

c. Capacitor C11 improves the coupling of band 2 at the higher frequencies. The rear section of S1D shorts to ground the two tuned secondaries of T2, which are not being used.

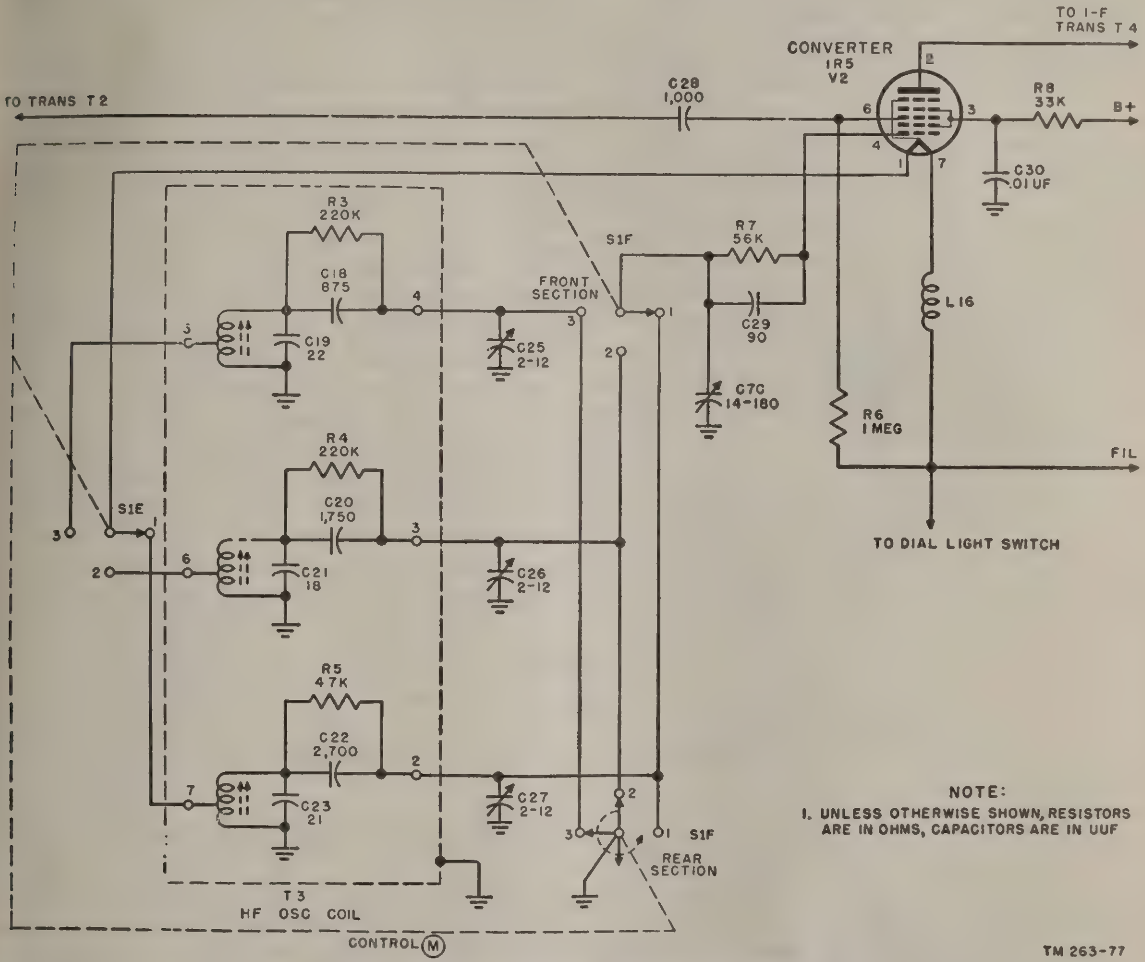

TO I-F TRANS T 4
CONVERTER
1R5
V2
C28
1,000
TO TRANS T2
R8
33K
B+
C30
.01 UF
R3
220K
C18
875
C19
22
S1F
FRONT SECTION
R7
56K
C29
90
C25
2-12
C7C
14-180
L16
R6
1 MEG
FIL
TO DIAL LIGHT SWITCH
R4
220K
C20
1,750
C21
18
C26
2-12
S1E
R5
47K
C22
2,700
C23
21
C27
2-12
S1F
REAR SECTION
T3
HF OSC COIL
CONTROL Ⓜ
NOTE:
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF
TM 263-77

Figure 58. Converter stage, simplified schematic.

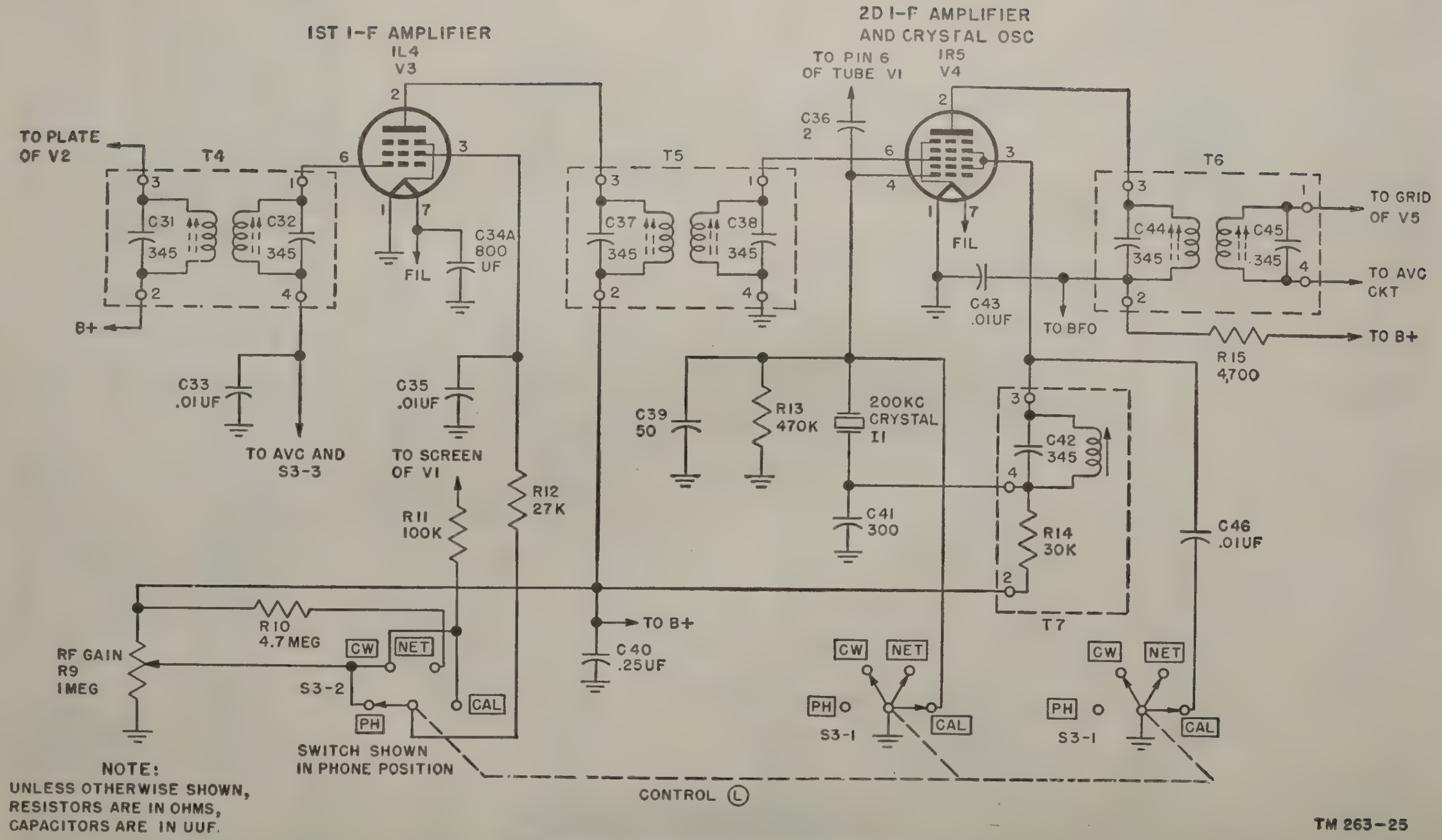
83. Converter Stage V2

(fig. 58)

a. The converter stage uses tube type 1R5 as a combined mixer and h-f oscillator of the series fed Hartley type, using the first two grids and the filament.

b. The resonant circuit in the oscillator portion of V2 is formed by one coil of T3, which is selected by switches S1E and S1F and, assuming band 1 is chosen, is tuned to resonance by the ganged capacitor C7C Ⓝ, adjustable trimmer C27, and capacitor C23. Capacitor C23 is used as a frequency corrector for temperature changes. When the temperature increases, the coil inductance increases, thus lowering the frequency; however, the capacitor is so made as to decrease its capacity when the temperature increases. The decreased capacitance opposes the increased inductance and the temperature effect on tuning is nullified.

c. Resistor-capacitor combination R5 and C22 provides the grid-leak bias for the oscillator grid (band 1) pin 4 of tube V2.


1ST I-F AMPLIFIER
1L4
V3
2D I-F AMPLIFIER
AND CRYSTAL OSC
1R5
V4
TO PIN 6
OF TUBE V1
C36
2
TO PLATE
OF V2
T4
T5
T6
T7
C31
345
C32
345
C37
345
C38
345
C44
345
C45
345
C42
345
C34A
800
UF
FIL
C33
.01 UF
C35
.01UF
C43
.01UF
TO BFO
TO GRID
OF V5
TO AVC
CKT
TO B+
R15
4,700
B+
TO AVC AND
S3-3
TO SCREEN
OF V1
R11
100K
R12
27K
C39
50
R13
470K
200KC
CRYSTAL
I1
C41
300
R14
30K
C46
.01UF
R10
4.7 MEG
RF GAIN
R9
1MEG
CW
NET
CAL
PH
S3-2
S3-1
SWITCH SHOWN
IN PHONE POSITION
TO B+
C40
.25UF
CONTROL Ⓛ
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

TM 263–25

Figure 59. I-f amplifiers, simplified schematic.

d. Resistor-capacitor combination R7 and C29 is placed in the grid circuit to provide additional bias.

e. Grid 2, pin 3 of tube V2, acts as the oscillator plate and receives its plate voltage through resistor R8 which is bypassed to ground for r-f through capacitor C30.

f. Choke coil L16 prevents r-f currents from entering the filament circuit and causing disturbances in the other tubes. Resistor R6 is the signal grid return resistor.

g. The h-f oscillator is tuned by Ⓝ TUNING capacitor C7C so that it is always 456 kc higher in frequency than the signal frequency. Thus, when the received signal from the r-f amplifier is applied to grid 3, pin 6 of tube V2, the two frequencies will beat together, forming sum and difference frequencies. The tuned primary of i-f transformer T4 in the plate of the mixer section is resonant at the difference frequency of 456 kc and, therefore, allows only this frequency to continue on to the first i-f amplifier V3 (fig. 59). The primary and secondary of i-f transformer T4 are shunted by capacitors C31 and C32, respectively. These capacitors, combined with adjustable powdered iron cores inserted in the primary and secondary coils, tune the transformer to 456 kc.

84. I-F Amplifiers V3 and V4

(fig. 59)

a. Two i-f amplifier stages are used, the first stage, V3, using tube type 1L4, and the second stage, V4, using tube type 1R5. The 456-kc signal leaves the transformer T4 secondary and is applied to V3. The gain of V3 is controlled by the voltage on the screen grid, pin 3, which is fed through the Ⓟ R.F. GAIN resistor R12 from switch S3–2. Switch S3–2, control Ⓛ, leads to potentiometer R9, control Ⓟ, which is across the plate supply voltage. The screen grid voltage for tube V3 may be controlled only when switch S3–2 is in the PHONE, C.W., or CAL. position. During net operation, the r-f gain may be varied by changing the screen voltage to the first r-f tube V1 only. Thus, switch S3–2 permits tube V3 to be used together with the tube V1, or not at all, to control the r-f gain. Also, during net operation, the gain of tube V3 is reduced because of the introduction of the larger screen circuit dropping resistor R10.

b. Capacitor C35 acts as a bypass for the screen voltage supply resistors, R12 and R9. Capacitor C33 is used as a filter capacitor for the avc voltage, supplying bias to the control grid, pin 6 of tube V3. Capacitor C33 also completes the r-f path from the low side of i-f transformer T4 to the filament of tube V3. Capacitor C40 is a bypass capacitor for the B+ supply line.

c. The output of V3 is fed through the primary of transformer T5 which is identical to T4 and the signal is applied to the input grid, pin 6 of tube V4. Tube V4, tube type 1R5, acts as a second i-f amplifier and crystal oscillator. When switch S3–1, control Ⓛ, is in the PHONE, C.W., or NET position, the oscillator portion is shorted out and the tube acts as a straight i-f amplifier. There is no d-c grid bias on the signal grid of V4 since the low side of i-f transformer T5 is connected directly to the filament, pin 1 of V4. Plate voltage is fed through r-f filter resistor R15, which is bypassed to the filament by filter capacitor C43.

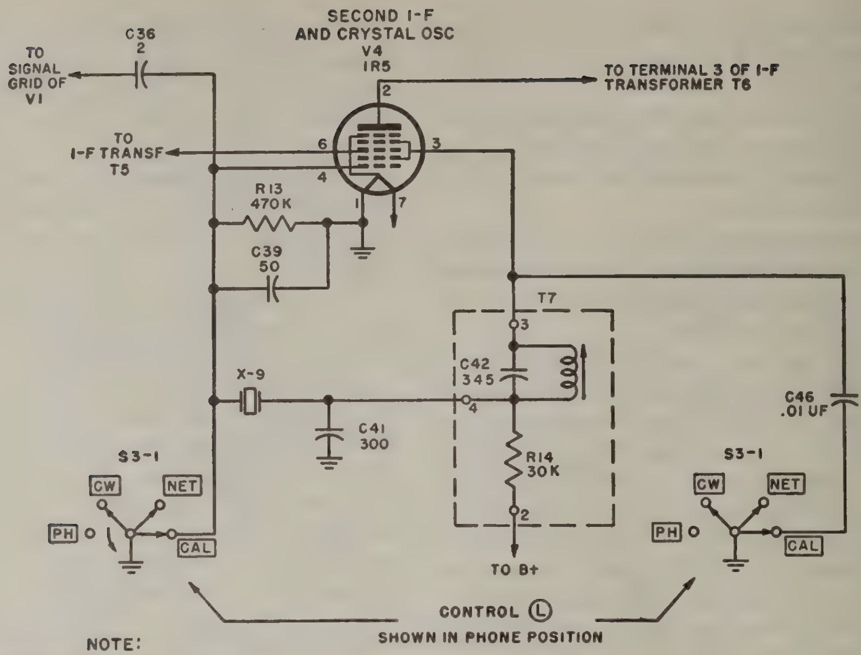
d. The amplified output signal from V4 is fed to i-f transformer T6, which is identical to T5 and T4; from T6, the signal is applied to the detector tube V5.

85. Crystal Calibrating Circuit

(fig. 60)

a. A crystal calibrating circuit is included as part of the second i-f stage and utilizes grids 1 and 2 of tube V4. Grid 1 (pin 4) is the oscillator grid, and the screen grid (pin 3) is used as the oscillator plate. This circuit is resonant at 200 kc and provides the means of checking accurately the receiver calibration at 200-kc intervals. This oscillator will operate only when switch S3–1 is in the CAL. position. Calibration of the receiver is obtained by feeding harmonics of the crystal oscillator signal from the oscillator grid (pin 4) through coupling capacitor C36 to the control grid of V1.

b. This signal is amplified by the first r-f amplifier and fed to the signal grid, pin 6 of the converter tube V2. In this tube it is mixed with the h-f oscillator signal to form an i-f signal of 456 kc which is passed on through the intermediate amplifier stages. Upon leaving i-f transformer T6, the signal is mixed with the output of the bfo. Since the bfo generates a signal of


SECOND I-F
AND CRYSTAL OSC
V4
IR5
C36
2
TO
SIGNAL
GRID OF
V1
TO TERMINAL 3 OF I-F
TRANSFORMER T6
TO
I-F TRANSF
T5
6
2
3
4
1
7
R13
470K
C39
50
T7
3
C42
345
4
X-9
C41
300
R14
30K
2
C46
.01 UF
S3-1
CW
NET
PH
CAL
S3-1
CW
NET
PH
CAL
TO B+
CONTROL Ⓛ
SHOWN IN PHONE POSITION
TM 263-3

NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

Figure 60. Crystal calibrator circuit.

456 kc, a zero beat results, because the i-f signal is also 456 kc.

c. The tuning dial is placed at any setting corresponding to a harmonic of the 200-kc crystal. If the r-f and h-f oscillator tuned circuits are not tuned exactly to the frequency stated on the dial, it will be evident that the converter tube will not produce an i-f signal of precisely 456 kc. It will then be necessary to detune the TUNING knob slightly so that a frequency of 456 kc will be produced to zero-beat with the 456-kc output signal of the bfo. The amount of detuning necessary to obtain zero beat is the error in the dial calibration. If the zero-beat note occurs when the dial number, corresponding to the crystal harmonic frequency, is exactly under the hairline, the receiver dial is accurately calibrated.

d. The calibration may in this manner be checked at any dial point which corresponds to a frequency equal to any of the harmonics of the crystal oscillator 200-kc crystal. The crystal oscillator therefore acts as a very accurate signal generator. An external oscillator could be used but it is advantageous to have a self-contained signal generator, so that the receiver dial calibration can be checked at any time and at any place.

e. Transformer T7 is tuned to slightly higher than the crystal frequency of 200 kc, by means of capacitor C42 and an adjustable iron core. It is necessary for the tank circuit to be tuned to slightly above the crystal frequency, otherwise the circuit will not oscillate. Accurate adjustment of the iron core is made by the manufacturer and should not be disturbed.

f. Resistor R14 which is located within T7 is the screen grid voltage-dropping resistor. Capacitor C39 and grid leak resistor R13 develop the d-c bias voltage for the oscillator grid (pin 4). Capacitor C46 is the usual screen grid (pin 3) bypass when switch S3–1 is in any position but CAL. A plug-in type Crystal Unit CR–2B/U 200-kc crystal is used.

g. The crystal oscillator is prevented from working in any but the CAL. position by a section of switch S3–1 that returns grid 1 to ground.

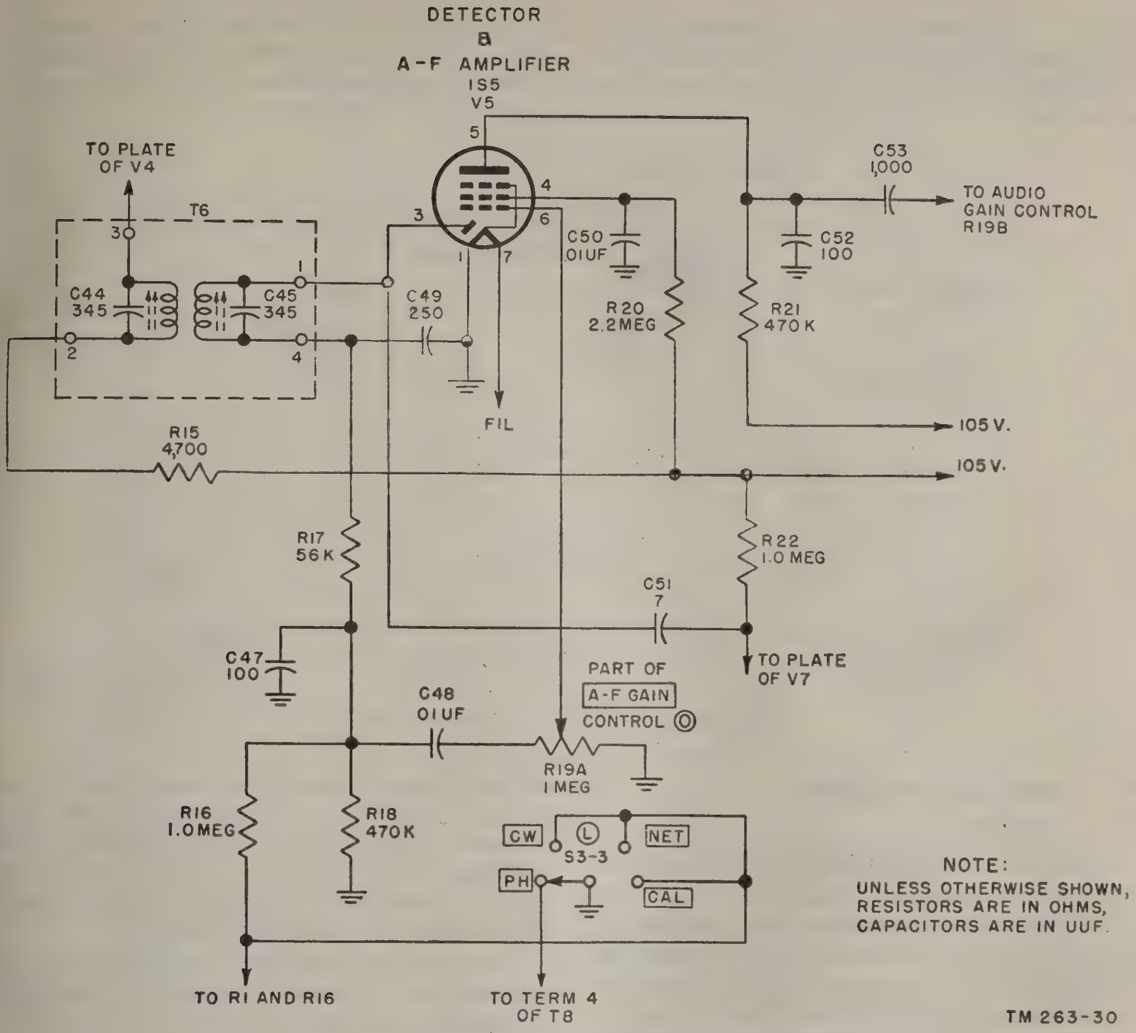

DETECTOR
&
A-F AMPLIFIER
1S5
V5
TO PLATE OF V4
T6
3
C44 345
C45 345
1
2
4
C49 250
5
4
6
7
1
3
C50 .01UF
R20 2.2MEG
FIL
C53 1,000
TO AUDIO GAIN CONTROL R19B
C52 100
R21 470K
105V.
105V.
R15 4,700
R17 56K
R22 1.0 MEG
C51 7
TO PLATE OF V7
C47 100
C48 .01UF
PART OF A-F GAIN CONTROL ◎
R19A 1MEG
R16 1.0MEG
R18 470K
CW
Ⓛ
NET
S3-3
PH
CAL
NOTE: UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
TO R1 AND R16
TO TERM 4 OF T8
TM 263-30

Figure 61. Detector and first audio amplifier, simplified schematic.

86. Detector and First Audio Amplifier
(fig. 61)

a. The detector stage uses the diode section of V5, tube type 1S5, as a diode detector. The output of the secondary of T6 is applied to the diode section, pin 3 of V5, where the signal voltage is rectified. Resistor R18 is the diode load across which is developed the audio voltage and avc voltage. Shunted across the diode load is capacitor C49 which, along with R17 and C47, filters out the i-f component.

b. Resistor R16 and capacitor C33 constitute a filter circuit which supplies the avc voltage to the grids of tubes V1 and V3. This filter is necessary to insure that only the d-c voltage and not the audio variations is applied to the avc controlled tubes. The avc voltage can be shorted to ground by means of switch S3–3, which is the case when any switch position but PHONE is in use.

c. The audio voltage appearing across the diode load resistors is tapped off above R18 and applied through coupling capacitor C48 to the A.F. GAIN control, R19A, marked ◎ on the receiver panel. From there the a-f signal goes to the control grid, pin 6 of tube V5.

d. The d-c plate voltage is fed through plate load resistor R21 and the d-c screen voltage through dropping resistor R20 which is bypassed by capacitor C50. Plate resistor R21 is also bypassed, but the value of capacitor C52 is so chosen that only i-f and not a-f is bypassed to ground.

e. Capacitor C53 couples the a-f signal to A.F. GAIN control R19B which is ganged to R19A. The signal is then fed directly to the control grid of tube V6.

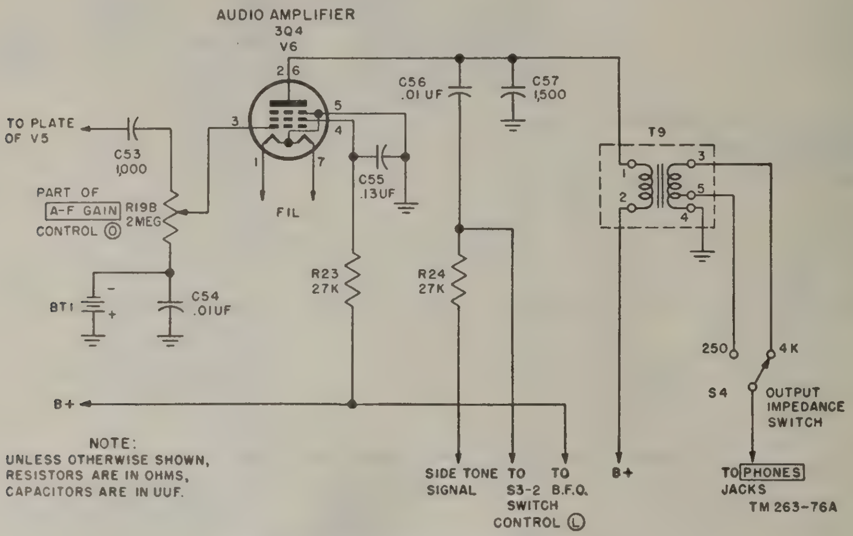

AUDIO AMPLIFIER
3Q4
V6
TO PLATE OF V5
C53 1,000
PART OF A-F GAIN CONTROL Ⓞ
R19B 2MEG
BT1
C54 .01UF
C55 .13UF
FIL
R23 27K
R24 27K
C56 .01 UF
C57 1,500
T9
250
4K
S4
OUTPUT IMPEDANCE SWITCH
B+
NOTE: UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
SIDE TONE SIGNAL
TO S3-2 SWITCH
TO B.F.O. CONTROL Ⓛ
TO PHONES JACKS
TM 263-76A

Figure 62. Second audio amplifier stage V6.

87. Second Audio Amplifier
(fig. 62)

a. Variable resistor R19B is the second section of the A.F. GAIN control. Better control of the audio gain is effected by ganging together the first audio control for V5 and the control for V6. The grid of V6 is biased by means of bias cell BT1, fixed bias is used to minimize distortion. The bias cell is bypassed for audio by capacitor C54. The plate load of audio amplifier V6 is the audio output transformer T9 which provides secondary output impedances of 250 and 4,000 ohms. The required output impedance is selected by switch S4 which is located on the rear of the receiver chassis. Capacitor C57 bypasses unwanted h-f and improves the stability of the audio signal. The screen receives voltage from resistor R23 which is bypassed by C55.

b. A sidetone monitoring system is incorporated to monitor the transmitter. When switch S3–2, control Ⓛ, is in the PHONE, C.W., or CAL. position and during operation of the transmitter, a sidetone signal is taken from the secondary of the modulation transformer in the transmitter and is connected to the primary of the receiver output transformer through resistor R24 and coupling capacitor C56. The sidetone volume is adjusted by means of the sidetone volume control located on the transmitter. The sidetone is shorted to ground when switch S3–2 is in the NET position.

c. Two phone jacks are provided so that two headsets can be placed in parallel across the secondary of output transformer **T9.**

88. Beat-frequency Oscillator
(fig. 63)

a. Since the received c-w code signal is not audible, it is necessary to provide means for producing an audible note. The bfo consists of an electron-coupled oscillator, the oscillator section being a series-fed Hartley circuit. The oscillator output, when beat against the amplified c-w i-f signal, produces an audible difference frequency. The fundamental of the bfo is 228 kc, but the second harmonic of 456 kc does the actual heterodyning.

b. The oscillator section of V7 uses grid 1 (pin 4) as the oscillator grid and uses grid 2 (pin 3) as the oscillator plate. The coil of T8 is tapped at the correct point to maintain oscilla-

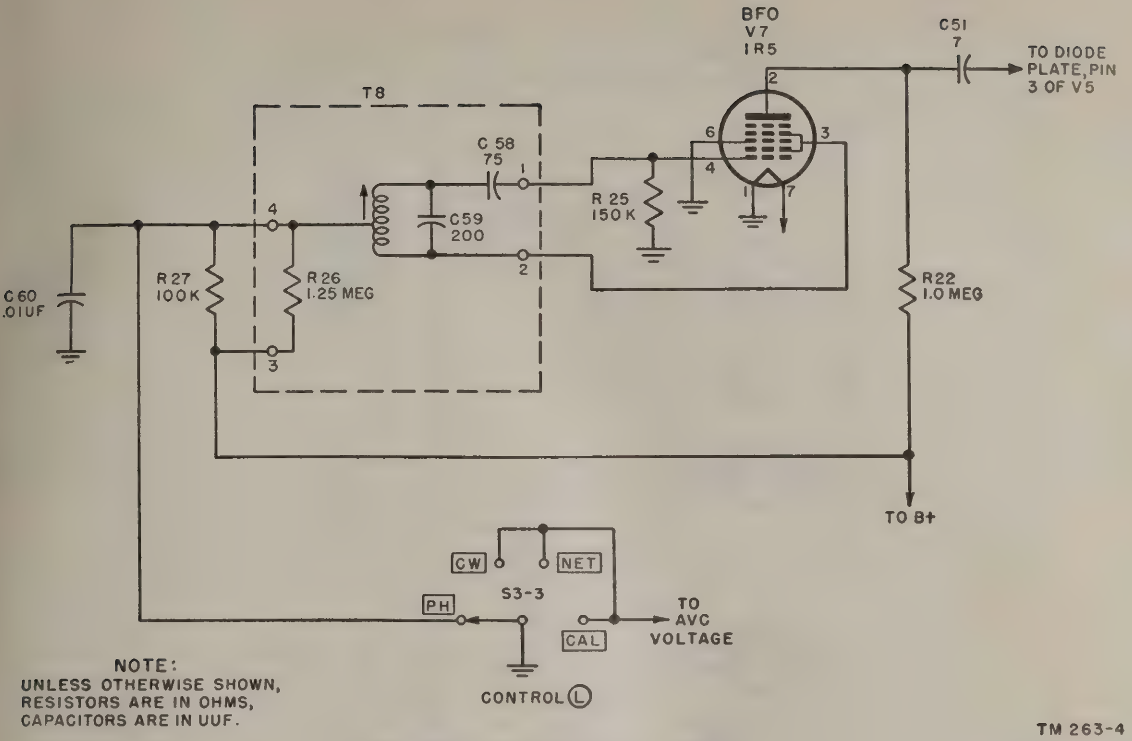

BFO
V7
1R5
C51
7
TO DIODE PLATE, PIN 3 OF V5
T8
C 58
75
1
2
6
3
4
7
R 25
150 K
C59
200
4
2
R 27
100 K
R 26
1.25 MEG
R22
1.0 MEG
C 60
.01UF
3
TO B+
CW
NET
S3-3
PH
TO AVC VOLTAGE
CAL
CONTROL Ⓛ
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
TM 263-4

Figure 63. Beat-frequency oscillator.

tions, and is directly connected for r-f, through capacitor C60, to the filament of V7. The tank coil is tuned to resonance by capacitor C59. Capacitor C58 is placed between the tank circuit and the oscillator grid so as to prevent the d-c voltage in the tank circuit from entering the oscillator grid circuit. The d-c bias is developed across grid-leak resistor R25, C58 acting as the grid leak capacitor. The oscillator plate (pin 3) receives its voltage through the parallel combination of resistors R26 and R27. The bfo is alined by adjustment of a powdered iron slug in coil T8.

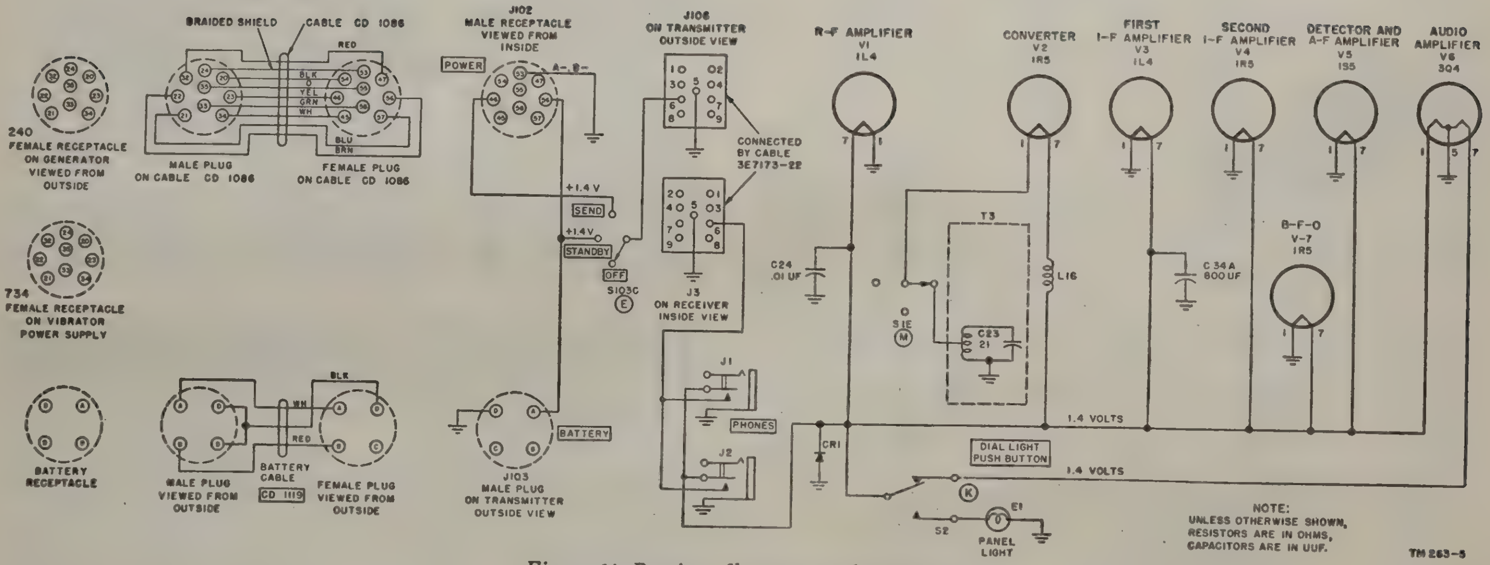
c. The oscillations produced by the oscillator section of V7 are electronically coupled to the plate circuit of V7, are amplified, and appear across resistor load R22. From resistor R22, the 456-kc signal is applied through capacitor C51 to the diode plate of detector tube V5. At the diode, it mixes with the incoming i-f signal and, if the main tuning capacitor is slightly detuned, there will be produced an audible beat note, the frequency of which is dependent on the amount of detuning. Capacitor C51 is necessary to keep the d-c plate voltage of V7 off the diode plate of tube V5.

d. The bfo is made inoperative on PHONE by means of switch S3–3 which connects the center tap of the tank coil directly to ground, thereby shorting out the bfo plate voltage.

89. Receiver Filament Voltage Supply
(fig. 64)

a. The vibrator power supply, the battery, or the hand-driven generator may be used to supply filament power. Connections of the various cables to the radio set can be seen from the cording diagram (fig. 42).

b. Cord CD–1086 connects either Vibrator Power Unit PE/237 or Generator GN–58–A to male plug J102 on the transmitter, which in turn is connected to switch S103C, control Ⓡ. Battery BA–48 also is connected to S103C and is in effect, in parallel with the generator and vibrator. Switch S103C allows the battery to be used for the STANDBY position only. In tne SEND position, only the vibrator or the generator may be used.


240
FEMALE RECEPTACLE ON GENERATOR VIEWED FROM OUTSIDE
734
FEMALE RECEPTACLE ON VIBRATOR POWER SUPPLY
BATTERY RECEPTACLE
BRAIDED SHIELD
CABLE CD 1086
RED
BLK
O
YEL
GRN
WH
BLU
BRN
MALE PLUG ON CABLE CD 1086
FEMALE PLUG ON CABLE CD 1086
BLK
WH
RED
BATTERY CABLE
CD 1119
MALE PLUG VIEWED FROM OUTSIDE
FEMALE PLUG VIEWED FROM OUTSIDE
J102
MALE RECEPTACLE VIEWED FROM INSIDE
POWER
A- B-
+1.4 V
SEND
+1.4 V
STANDBY
OFF
S103C
E
J103
MALE PLUG ON TRANSMITTER OUTSIDE VIEW
BATTERY
J106
ON TRANSMITTER OUTSIDE VIEW
CONNECTED BY CABLE 3E7173-22
J3
ON RECEIVER INSIDE VIEW
J1
J2
PHONES
R-F AMPLIFIER
V1
1L4
CONVERTER
V2
1R5
FIRST I-F AMPLIFIER
V3
1L4
SECOND I-F AMPLIFIER
V4
1R5
DETECTOR AND A-F AMPLIFIER
V5
1S5
AUDIO AMPLIFIER
V6
3Q4
B-F-O
V-7
1R5
C24
.01 UF
T3
C23
21
L16
C 34A
800 UF
S1E
M
CR1
1.4 VOLTS
1.4 VOLTS
DIAL LIGHT PUSH BUTTON
K
S2
E1
PANEL LIGHT
TM 263-5

NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

Figure 64. Receiver filament supply circuits.

uit
be
3
7
rd
01.
3
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18

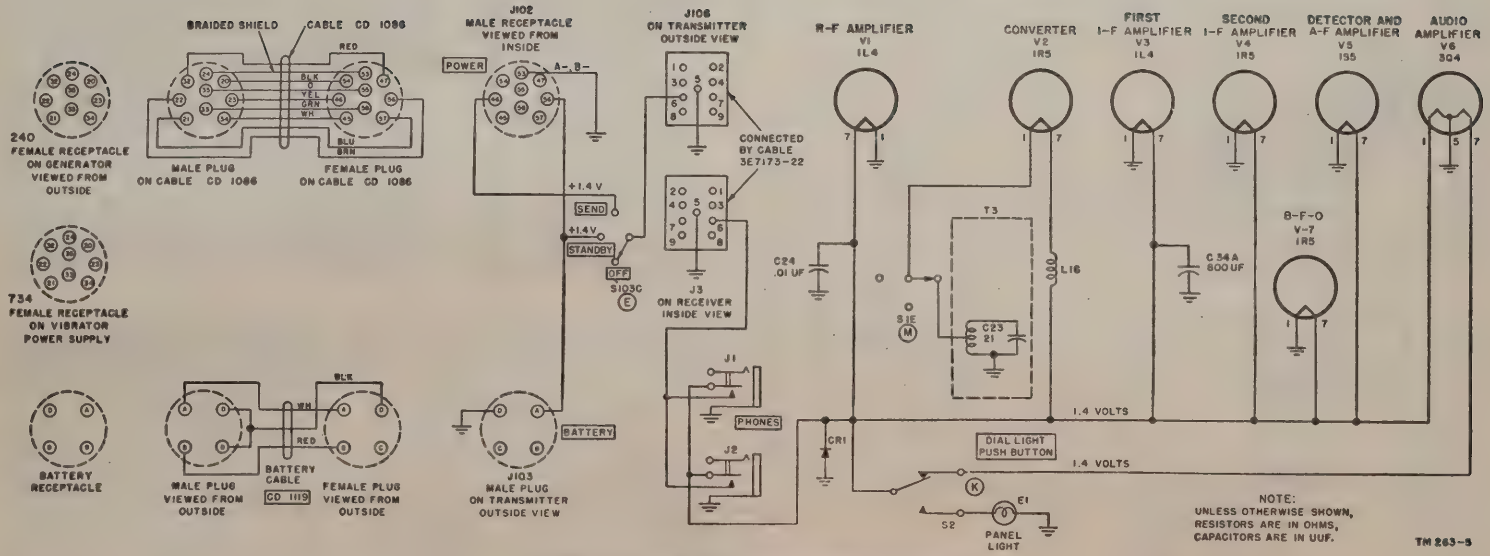
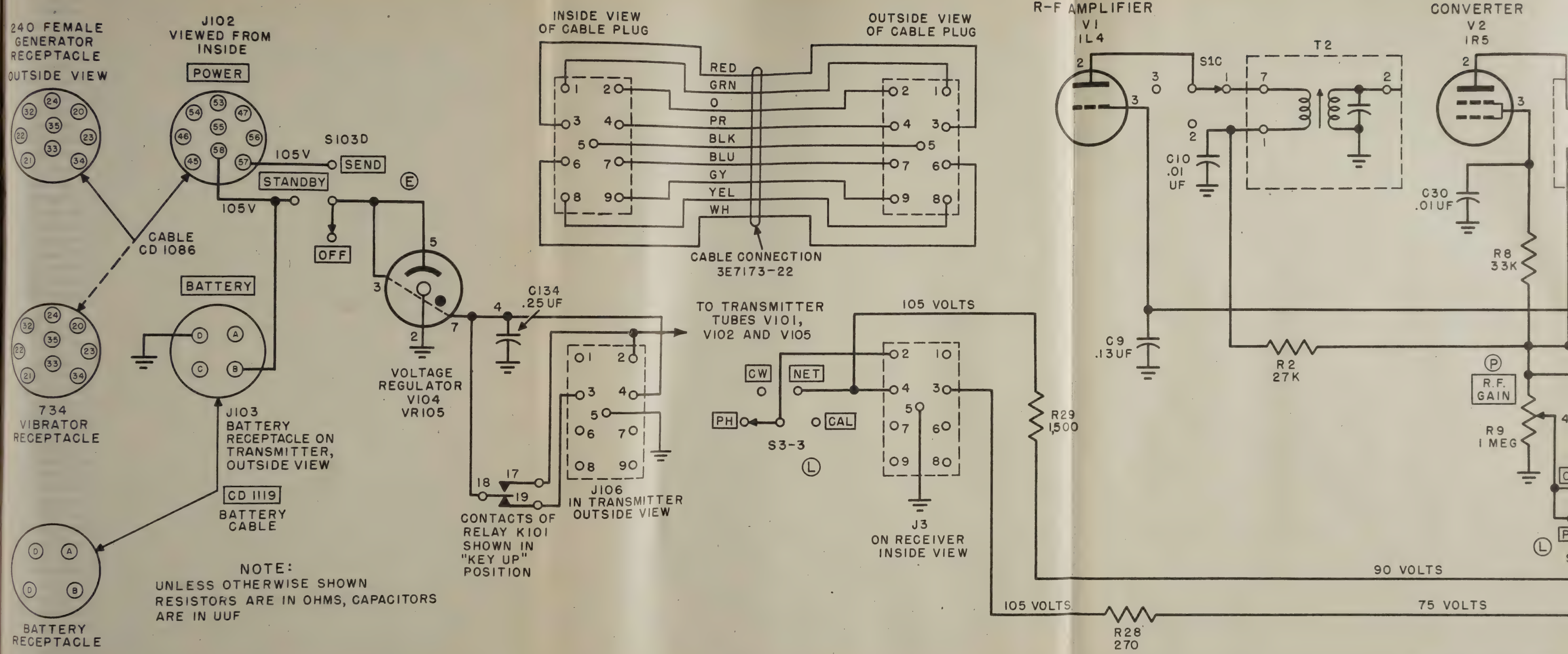
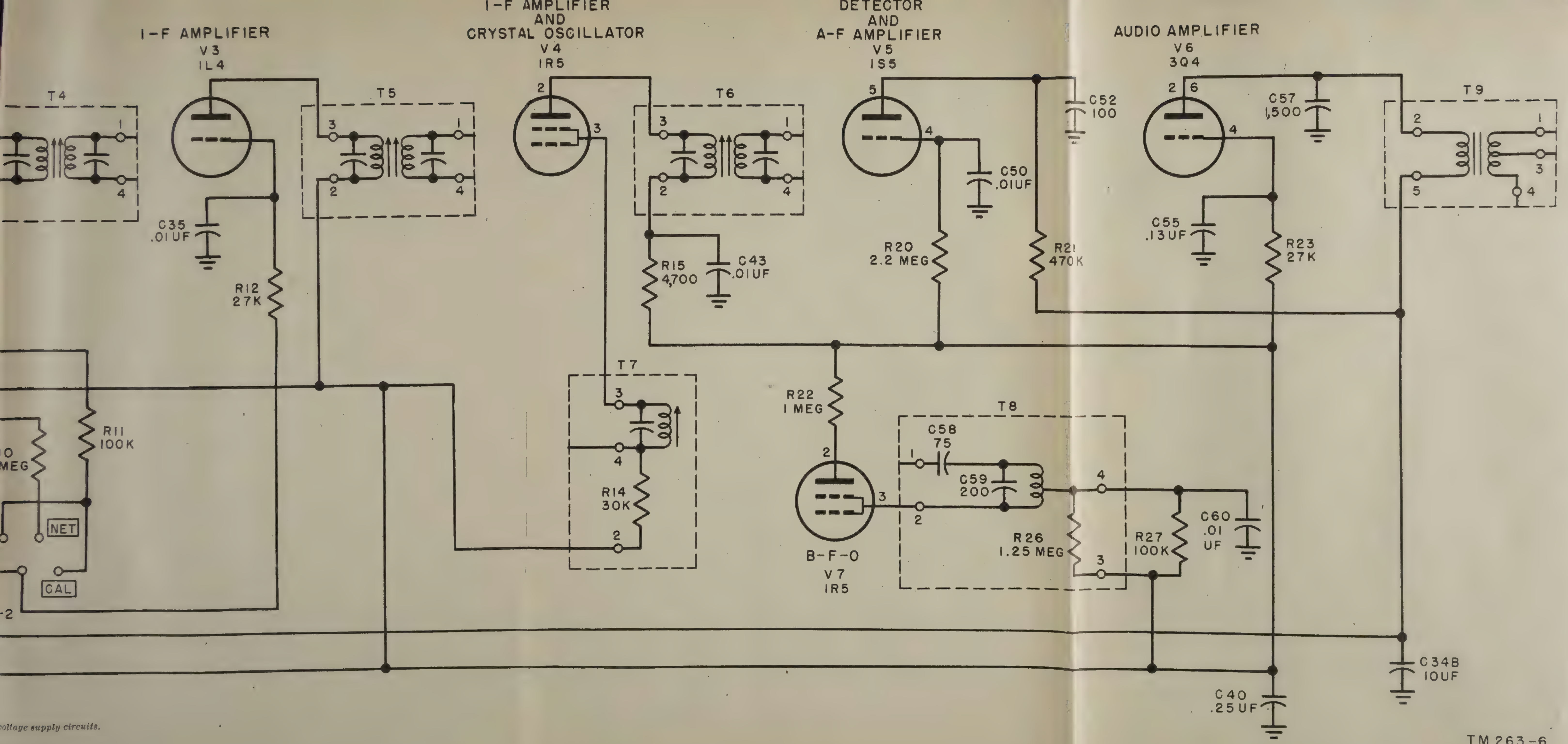

240
FEMALE RECEPTACLE
ON GENERATOR
VIEWED FROM
OUTSIDE
734
FEMALE RECEPTACLE
ON VIBRATOR
POWER SUPPLY
BATTERY
RECEPTACLE
BRAIDED SHIELD
CABLE CD 1086
RED
BLK
O
YEL
GRN
WH
BLU
BRN
MALE PLUG
ON CABLE CD 1086
FEMALE PLUG
ON CABLE CD 1086
BLK
WH
RED
BATTERY
CABLE
CD 1119
MALE PLUG
VIEWED FROM
OUTSIDE
FEMALE PLUG
VIEWED FROM
OUTSIDE
J102
MALE RECEPTACLE
VIEWED FROM
INSIDE
POWER
A-, B-
+1.4 V
SEND
+1.4V
STANDBY
OFF
S103C
E
BATTERY
J103
MALE PLUG
ON TRANSMITTER
OUTSIDE VIEW
J106
ON TRANSMITTER
OUTSIDE VIEW
CONNECTED
BY CABLE
3E7173-22
J3
ON RECEIVER
INSIDE VIEW
J1
J2
PHONES
R-F AMPLIFIER
V1
1L4
C24
.01 UF
CR1
CONVERTER
V2
1R5
T3
C23
21
L16
S1E
M
FIRST
I-F AMPLIFIER
V3
1L4
C34A
800 UF
SECOND
I-F AMPLIFIER
V4
1R5
DETECTOR AND
A-F AMPLIFIER
V5
1S5
AUDIO
AMPLIFIER
V6
3Q4
B-F-O
V-7
1R5
1.4 VOLTS
1.4 VOLTS
DIAL LIGHT
PUSH BUTTON
K
S2
E1
PANEL
LIGHT
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
TM 263-5

Figure 64. Receiver filament supply circuits.


240 FEMALE GENERATOR RECEPTACLE OUTSIDE VIEW
24
32
20
35
22
23
33
21
34
J102 VIEWED FROM INSIDE
POWER
53
54
47
55
46
56
58
45
57
105V
S103D
SEND
STANDBY
105V
E
CABLE CD 1086
OFF
5
3
2
7
VOLTAGE REGULATOR V104 VR105
BATTERY
D
A
C
B
734 VIBRATOR RECEPTACLE
J103 BATTERY RECEPTACLE ON TRANSMITTER, OUTSIDE VIEW
CD 1119
BATTERY CABLE
BATTERY RECEPTACLE
INSIDE VIEW OF CABLE PLUG
OUTSIDE VIEW OF CABLE PLUG
RED
GRN
O
PR
BLK
BLU
GY
YEL
WH
CABLE CONNECTION 3E7173-22
C134 .25 UF
4
TO TRANSMITTER TUBES V101, V102 AND V105
18
17
19
CONTACTS OF RELAY K101 SHOWN IN "KEY UP" POSITION
J106 IN TRANSMITTER OUTSIDE VIEW
105 VOLTS
CW
NET
PH
CAL
S3-3
L
J3 ON RECEIVER INSIDE VIEW
R29 1,500
90 VOLTS
105 VOLTS
R28 270
75 VOLTS
R-F AMPLIFIER V1 1L4
S1C
T2
C10 .01 UF
C9 .13 UF
R2 27K
CONVERTER V2 1R5
C30 .01 UF
R8 33K
P
R.F. GAIN
R9 1 MEG
L

NOTE:
UNLESS OTHERWISE SHOWN
RESISTORS ARE IN OHMS, CAPACITORS
ARE IN UUF

Figure 65. Receiver plate and screen g


I-F AMPLIFIER
V3
1L4
I-F AMPLIFIER AND CRYSTAL OSCILLATOR
V4
1R5
DETECTOR AND A-F AMPLIFIER
V5
1S5
AUDIO AMPLIFIER
V6
3Q4
T4
T5
T6
T7
T8
T9
C35 .01UF
R12 27K
R15 4,700
C43 .01UF
C52 100
C50 .01UF
R20 2.2 MEG
R21 470K
C57 1,500
C55 .13UF
R23 27K
R11 100K
10 MEG
NET
CAL
-2
R14 30K
R22 1 MEG
C58 75
C59 200
R26 1.25 MEG
R27 100K
C60 .01 UF
B-F-O
V7
1R5
C40 .25UF
C34B 10UF

voltage supply circuits.

TM 263-6

c. Switch S103C then leads to the female transmitter jack, J106, which is connected by cable 3E7173–22 to female receiver jack J3. Jack J3 is connected to the headphone jacks J1 and J2. These headphone jacks act as a switch; when the headphones are not plugged into the jack, the filament circuit is disconnected.

d. The filaments are all connected in parallel, including the two filaments in tube V6 (tube type 3Q4). The dial light switch S2, control Ⓚ, disconnects one half of the filament of tube V6, and connects in its place the dial light E1.

e. CR1 is a selenium metallic rectifier which serves as a filament voltage regulator, maintaining it at 1.4 volts. Capacitor C24 is an r-f bypass which is so connected that the r-f will not enter the filament supply lines. Choke L16 in the filament lead of tube V2 also serves this purpose. The filament of V2 is connected to the h-f oscillator coils by means of band switch S1E, control Ⓜ. C–34A acts as an r-f and i-f filter capacitor.

90. Receiver Plate and Screen Grid Circuits (fig. 65)

a. The plate and screen grid voltages are obtained from the generator, the vibrator unit, or the battery. Either the generator or the vibrator may be selected by means of connecting Cord CD–1086, as shown in the cording diagram (fig. 42).

b. The selected power supply is connected through Cord CD–1086 to the transmitter receptacle J102. Receptacle J102 is then connected to switch S103D, control Ⓕ, which determines if the battery is to be used instead of the generator or vibrator. The contact marked STANDBY is connected to pin B on the battery plug and to pin 58 on J102. Pin 58 is connected by cable to pin 33 of generator receptacle 240. The generator wiring diagram (fig. 137) shows that pin 33 is not connected to anything. Therefore, on the STANDBY position of switch S103D, only the battery supplies power to the receiver. On the SEND position of control Ⓔ, the battery is disconnected, and the receiver is connected through pin 57 on J102 to pin 21 on receptacle 240 and from there to the h-v coil on the generator.

c. From switch S103D, the voltage is applied across tube V104, a voltage regulator which keeps the voltage that is fed to the plate circuit equal to exactly 105 volts. The output of tube V104, pin 5, is externally connected to pin 3 which is internally connected to pin 7. Pin 7 is then connected to pin 4 on terminal board J106 and to contact 18 on keying relay K101. Relay K101 further determines whether pin 3 or pin 2 is to be connected to the supply voltage. Pin 4 is constantly energized, regardless of the position of relay K101, because it is directly connected to pin 7 of the voltage regulator tube V105.

d. Transmitter terminal board J106 is connected to receiver terminal board J3 through cable 3E7173–22. The plate voltages of tubes V5 and V6 only are obtained from pin 4 on J3. All other plate and screen voltages are obtained from pin 3 on J3.

e. When the transmitter section is not in use, contact 19 of relay K101 is connected with contact 18 to the power supply, and all the receiver tubes receive plate and screen grid voltage. However, when the transmitter key is depressed or the press-to-talk switch on the microphone is pushed, relay K101 disconnects contact 19 and connects contact 17 to the power supply. The disconnection of contact 19 removes screen voltage from all tubes, and plate voltage from all tubes but tubes V5 and V6.

f. In order to tune the transmitter to the receiver frequency for net operation, it is necessary that both the transmitter and receiver operate simultaneously. However, it has been pointed out that, because of relay K101, only the receiver or the transmitter may function at any one time, depending on the position of the key or microphone button. If the handkey is left up, the receiver will automatically obtain voltage since relay contacts 18 and 19 will remain closed. Thus it will be necessary only to short contacts 18 and 17 by some external means, to provide voltage to the transmitter. This is the function of switch S3–3, control Ⓛ, located within the receiver cabinet. Figure 65 shows that relay contact 17 is connected to pin 2 on receptacle J106, which is in turn connected by cable 3E7173–22 to pin 2 of receptacle J3 in the receiver cabinet. Pin 2 of receptacle J3 connects to the movable rotor of switch S3–3. When switch S3–3 is placed on NET position pin 2 is directly connected to pin 4 on receptacle J3. This effectively shorts contacts 17 and 18 of relay K101, thus supplying voltage to the transmitter tubes. Only some of the transmitter tubes are energized to permit net operation.

g. The plates of tubes V5 and V6 receive their voltage through dropping resistor R29 while the plate and screen currents of the other tubes pass through resistor R28. This is don so that the low-frequency audio signals of V and V6 cannot modulate the r-f signals in th other tubes, or cause oscillations, which migh occur if allowed to pass through the same dropping resistor used by the r-f and i-f stages.

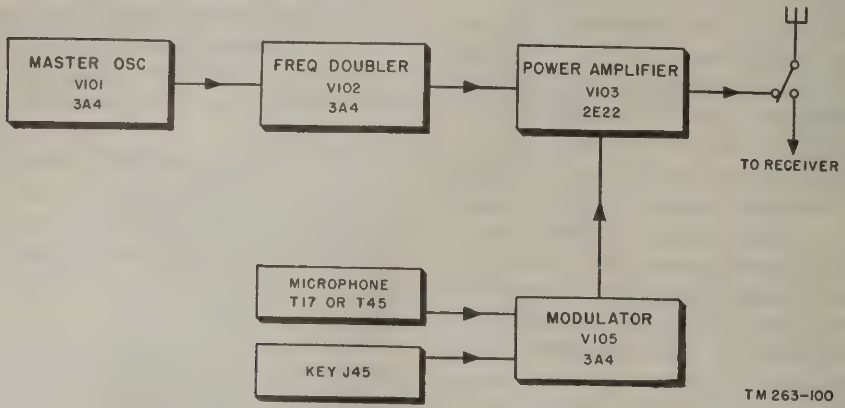


Figure 66. Block diagram of transmitter section of receiver-transmitter RT–77/GRC–9.

Section II. THEORY OF TRANSMITTER SECTION OF RADIO SET AN/GRC–9

91. Block Diagram
(fig. 66)

a. GENERAL. The transmitter section of Receiver-Transmitter RT–77/GRC–9 consists of a master oscillator, frequency doubler, power amplifier, and modulator circuit as shown in the block diagram (fig. 66). The circuit is designed to provide c-w, mcw, and voice modulated signals over a frequency range of 2.0 to 12.0 mc. As in the case of the receiver, the frequency range is covered in three bands, 2.0 to 3.6 mc, 3.6 to 6.6 mc, and 6.6 to 12.0 mc.

b. BLOCK DIAGRAM (fig. 66). The block diagram shows a master oscillator, which can be either self-excited or crystal-controlled, to supply an r-f signal voltage to the grid of the doubler stage whose plate circuit is tuned to the second harmonic of the input signal. The output of this stage is fed to the grid of the power amplifier stage at a sufficient power level to drive the power amplifier as a Class C amplifier. The modulator circuit supplies the audio power necessary to *suppressor grid modulate* the power amplifier during phone and mcw operation. The output of the power amplifier is then coupled to the antenna through a suitable coupling network.

92. Master Oscillator (Noncrystal-controlled) Tube V101, Tube Type 3A4
(fig. 67)

a. The oscillator section of the transmitter may be either crystal-controlled or a self-excited tuned-plate tickler coil feedback oscillator. For the present, the noncrystal-controlled master oscillator will be discussed for band 1.

b. The upper coil of assembly T101 is in the plate circuit of V101 and is tuned to any frequency from 3.3 to 6 mc, considering band 1 only, by means of ganged capacitor C101A, control ①, alinement trimmer C106B, calibrating capacitor C102, control Ⓗ, and fixed capacitor C146. Ganged capacitor C101A is plugged into terminal board J101A, and is therefore a complete plug-in unit. Plate voltage to V101 is applied through filter resistor R103 which is bypassed for r-f by filter capacitor C104 and resistors R105, R120, and R121. Screen grid voltage is fed through dropping resistor R101 which is bypassed for r-f by capacitor C103.

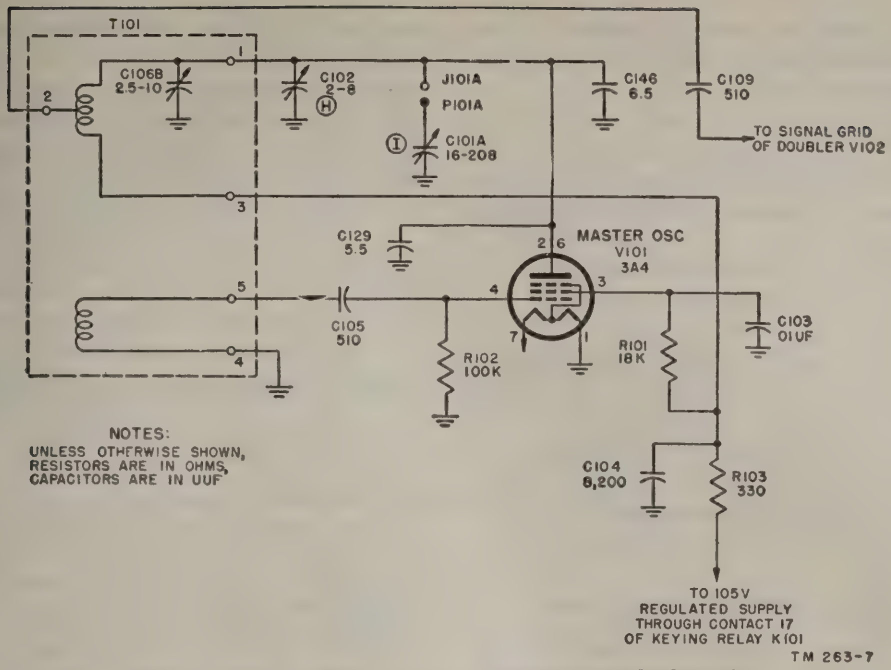

T101
C106B
2.5-10
C102
2-8
Ⓗ
J101A
P101A
Ⓘ
C101A
16-208
C146
6.5
C109
510
TO SIGNAL GRID
OF DOUBLER V102
C129
5.5
MASTER OSC
V101
3A4
C105
510
R102
100K
R101
18K
C103
.01UF
C104
8,200
R103
330
NOTES:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TO 105V
REGULATED SUPPLY
THROUGH CONTACT 17
OF KEYING RELAY K101
TM 263-7

Figure 67. Transmitter master oscillator, simplified schematic.

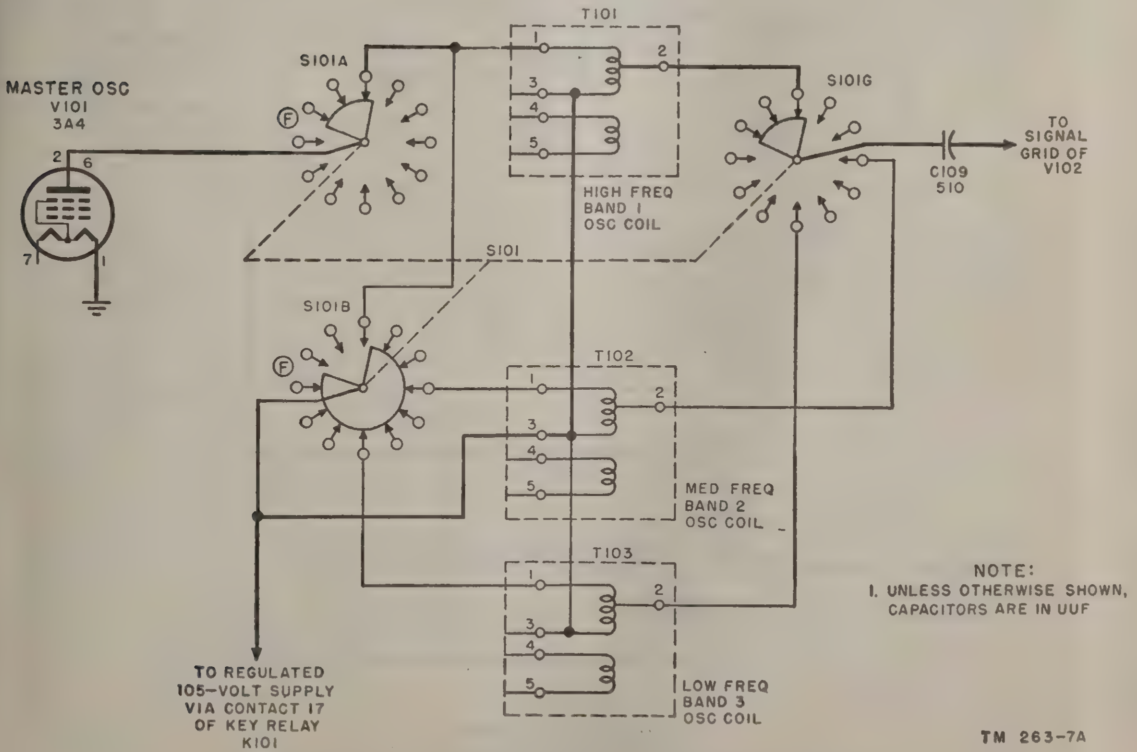

MASTER OSC
V101
3A4
S101A
Ⓕ
T101
HIGH FREQ
BAND 1
OSC COIL
S101G
TO
SIGNAL
GRID OF
V102
C109
510
S101
S101B
T102
MED FREQ
BAND 2
OSC COIL
T103
LOW FREQ
BAND 3
OSC COIL
TO REGULATED
105-VOLT SUPPLY
VIA CONTACT 17
OF KEY RELAY
K101
NOTE:
1. UNLESS OTHERWISE SHOWN,
CAPACITORS ARE IN UUF
TM 263-7A

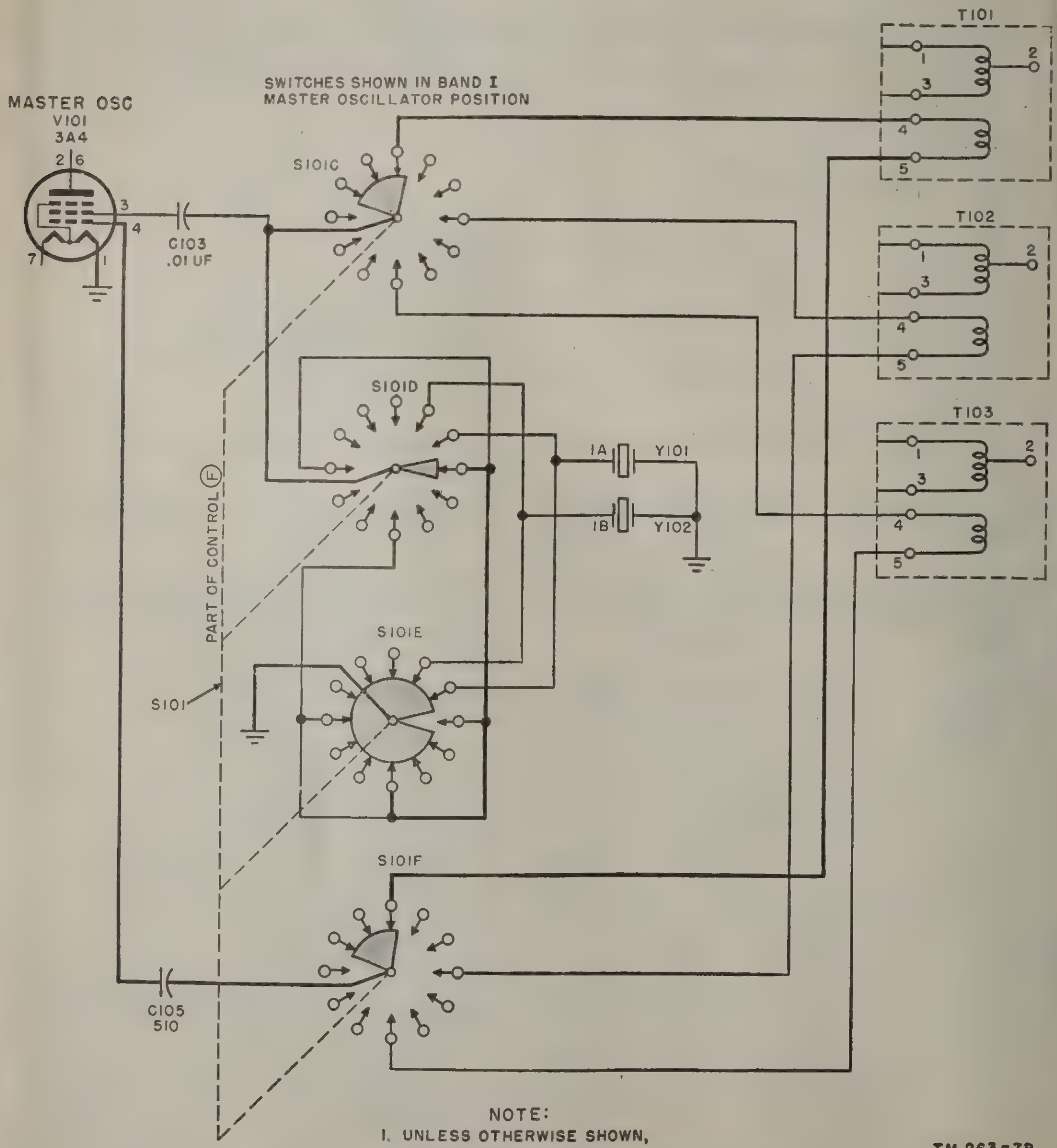
Figure 68. Master oscillator switch sections S101A and S101B.

c. The coupling necessary to sustain oscillations is produced magnetically by the plate and grid circuit coils of T101.

d. The control grid receives its d-c bias from the combination of grid leak resistor R102 and capacitor C105. The output from the oscillator is fed through capacitor C109 to the voltage doubler V102. C146 is a temperature compensating capacitor.

e. From the upper left of the main schemati (fig. 139), it can be seen that seven sections of switch S101, control Ⓕ, are associated with the oscillator circuit of V101.

(1) *S101A* (fig. 68). Section A of S101


MASTER OSC
V101
3A4
SWITCHES SHOWN IN BAND I
MASTER OSCILLATOR POSITION
S101C
S101D
S101E
S101F
S101
PART OF CONTROL Ⓕ
C103
.01 UF
C105
510
1A
1B
Y101
Y102
T101
T102
T103
2
6
3
4
7
1
5
TM 263-7B

NOTE:
1. UNLESS OTHERWISE SHOWN,
CAPACITORS ARE IN UUF

Figure 69. Master oscillator switch sections S101C, D, E, and F.

determines which of the three plate circuit coils is to be used. Thus, should control Ⓕ on the transmitter panel be turned to BAND 1, switch S101A would lead the plate current of tube V101 to the larger coil in transformer T101, and no other. This is shown by the weighted line in figure 68.

(2) *S101B* (fig. 68). Section B of S101 shorts out the other unused plate coils so as to prevent interaction with the coil circuit being used; such interaction tends to cause undesirable parasitic oscillations.

(3) *S101C* (fig. 69). Section C of S101 selects the proper grid circuit coil for the frequency selected. This is done in conjunction with switches S101D, S101E, and S101F which connect the coil selected to the grid by capacitor C105. Since the entire bank of switches is ganged, the grid coil is automatically connected to the grid circuit. By following the weighted line, starting at the signal grid of V101, the entire grid circuit path may be traced through the various switches.

(4) *S101D.* Section D of S101 selects, during crystal operation, the proper crystal to be used for the frequency desired. Section D also connects the grid coil to ground through section E, as shown in figure 69.

(5) *S101E.* The rotor of section E is permanently connected to ground and serves as the actual ground connection for the coil selected. It also shorts out all or any crystals that are not in use.

(6) *S101F.* Section F of S101 connects the selected coil to the grid of tube V101 through capacitor C105.

(7) *S101G* (fig. 68). Section G of S101 connects oscillator voltage from the plate coil in use to the signal grid of the voltage doubler V102.

93. Crystal Oscillator (Crystal-controlled) (fig. 70)

a. When control Ⓕ is at one of the XTAL positions, the circuit then functions as a crystal oscillator. Crystal 1A is placed in the grid circuit by means of switches S101D and S101E (fig. 71). Switch S101E disconnects from

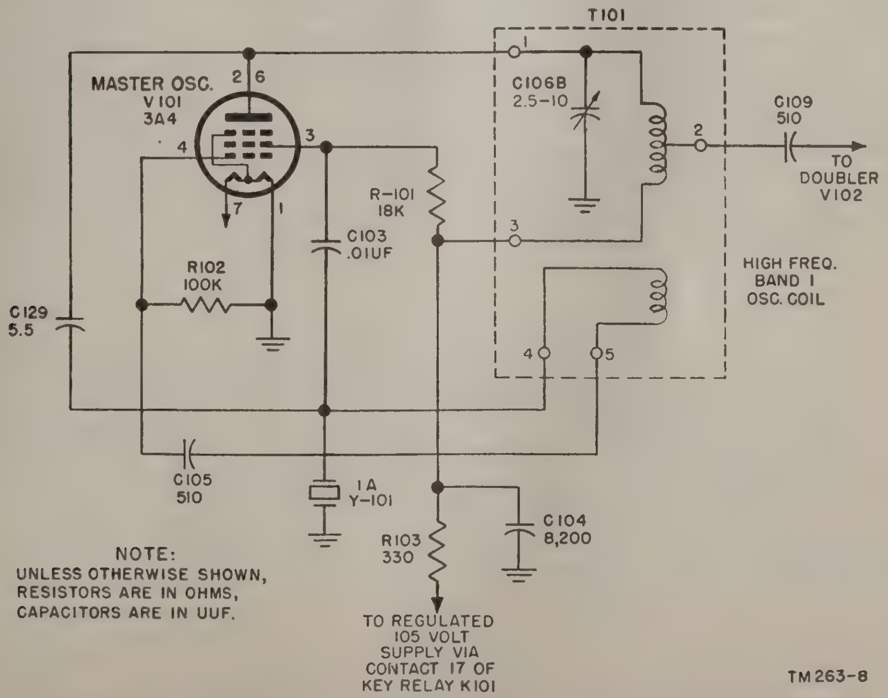

T101
MASTER OSC.
V101
3A4
2
6
3
4
7
1
1
C106B
2.5–10
2
C109
510
TO
DOUBLER
V102
R–101
18K
3
C103
.01UF
HIGH FREQ.
BAND I
OSC. COIL
R102
100K
C129
5.5
4
5
C105
510
1A
Y–101
C104
8,200
R103
330
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
TO REGULATED
105 VOLT
SUPPLY VIA
CONTACT 17 OF
KEY RELAY K101
TM263-8

Figure 70. Transmitter master oscillator (crystal-controlled), simplified schematic.

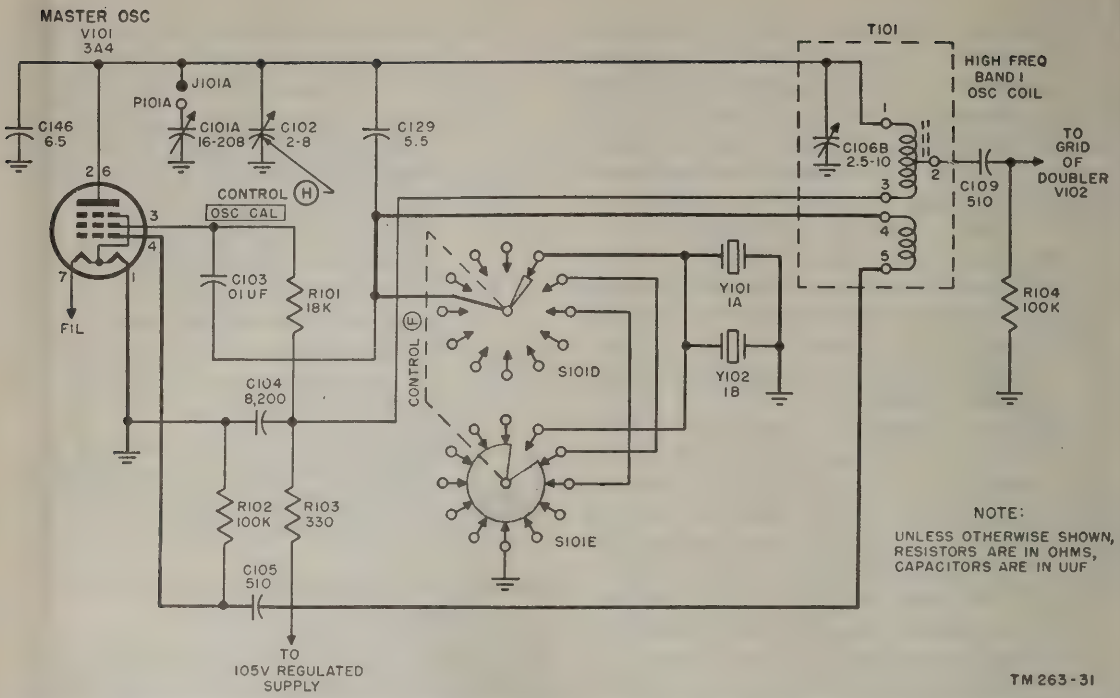

MASTER OSC
V101
3A4
J101A
P101A
C146
6.5
C101A
16-208
C102
2-8
C129
5.5
2
6
3
4
7
1
CONTROL (H)
OSC CAL
C103
.01 UF
R101
18K
FIL
C104
8,200
R102
100K
R103
330
C105
510
TO
105V REGULATED
SUPPLY
CONTROL (F)
S101D
S101E
Y101
1A
Y102
1B
T101
HIGH FREQ
BAND I
OSC COIL
C106B
2.5-10
1
2
3
4
5
C109
510
TO
GRID
OF
DOUBLER
V102
R104
100K
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TM 263-31

Figure 71. Transmitter master oscillator (crystal-controlled), switch sections S101D and S101E, simplified schematic.

ground the crystal used, and connects to ground all unused crystals.

b. Screen grid capacitor C103, which was an r-f bypass for MO operation, becomes by means of switches S101D and S101E, the coupling capacitor from the screen grid to the oscillator crystal. When control Ⓕ is at one of the XTAL positions, the circuit function is the same as for MO operation except that the ungrounded crystal circuit is coupled to the screen. When the tuned circuit is adjusted to the crystal, frequency V101 will oscillate by virtue of the fact that the combination of capacitor C103 and the crystal results in a low-impedance circuit on the screen grid. If the circuit is tuned to any other frequency but the crystal frequency, the resultant high-impedance circuit is not effectively bypassed to ground and the oscillation will cease since neither the screen grid nor the low r-f side of the feedback winding in the oscillator grid (pin 4) circuit is effectively bypassed to ground.

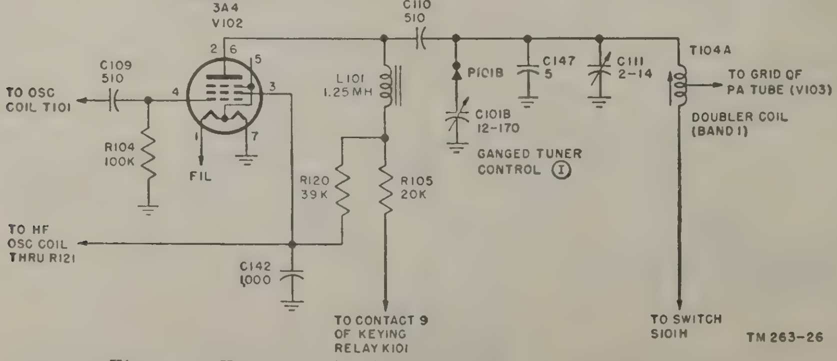

DOUBLER
3A4
V102
2
6
5
4
3
1
7
C109
510
TO OSC
COIL T101
R104
100K
FIL
C110
510
L101
1.25 MH
P101B
C147
5
C111
2-14
C101B
12-170
GANGED TUNER
CONTROL (I)
T104A
TO GRID OF
PA TUBE (V103)
DOUBLER COIL
(BAND I)
R120
39K
R105
20K
TO HF
OSC COIL
THRU R121
C142
1000
TO CONTACT 9
OF KEYING
RELAY K101
TO SWITCH
S101H
TM 263-26

Figure 72. Frequency doubler stage V102, simplified schematic.

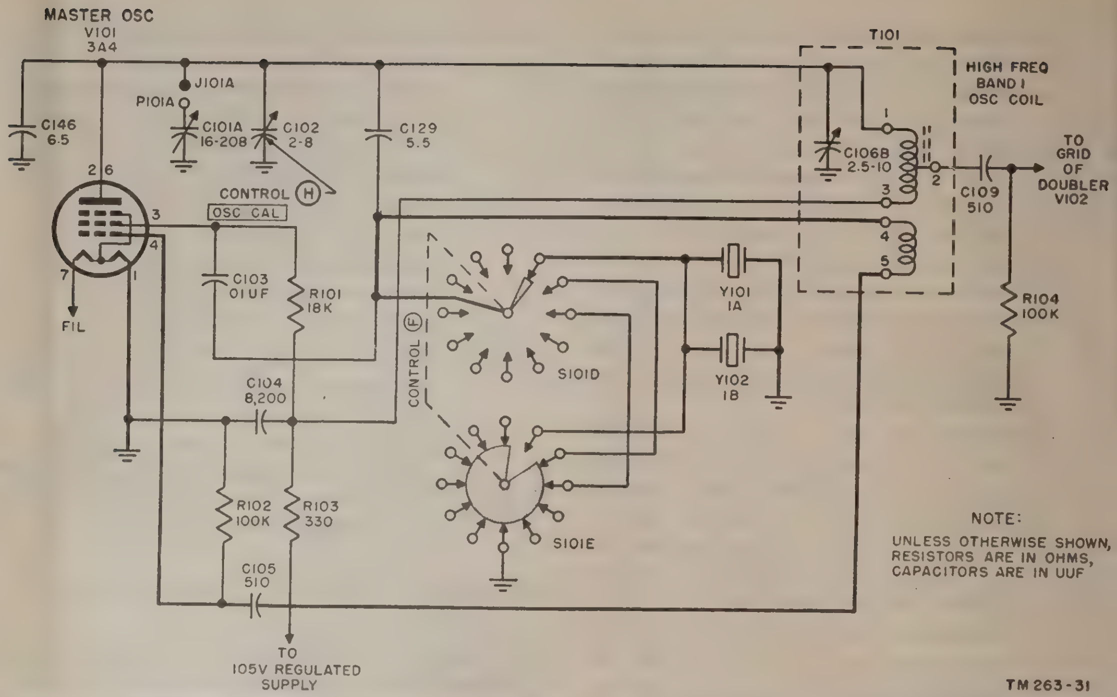

MASTER OSC
V101
3A4
J101A
P101A
C146
6.5
C101A
16-208
C102
2-8
C129
5.5
T101
HIGH FREQ
BAND I
OSC COIL
C106B
2.5-10
1
2
3
4
5
C109
510
TO GRID OF DOUBLER V102
CONTROL Ⓗ
OSC CAL
C103
.01UF
R101
18K
FIL
2
6
3
4
7
1
CONTROL Ⓕ
Y101
1A
Y102
1B
S101D
R104
100K
C104
8,200
R102
100K
R103
330
C105
510
S101E
TO
105V REGULATED
SUPPLY
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TM 263-31

Figure 71. Transmitter master oscillator (crystal-controlled), switch sections S101D and S101E, simplified schematic.

ground the crystal used, and connects to ground all unused crystals.

b. Screen grid capacitor C103, which was an r-f bypass for MO operation, becomes by means of switches S101D and S101E, the coupling capacitor from the screen grid to the oscillator crystal. When control Ⓕ is at one of the XTAL positions, the circuit function is the same as for MO operation except that the ungrounded crystal circuit is coupled to the screen. When the tuned circuit is adjusted to the crystal, frequency V101 will oscillate by virtue of the fact that the combination of capacitor C103 and the crystal results in a low-impedance circuit on the screen grid. If the circuit is tuned to any other frequency but the crystal frequency, the resultant high-impedance circuit is not effectively bypassed to ground and the oscillation will cease since neither the screen grid nor the low r-f side of the feedback winding in the oscillator grid (pin 4) circuit is effectively bypassed to ground.

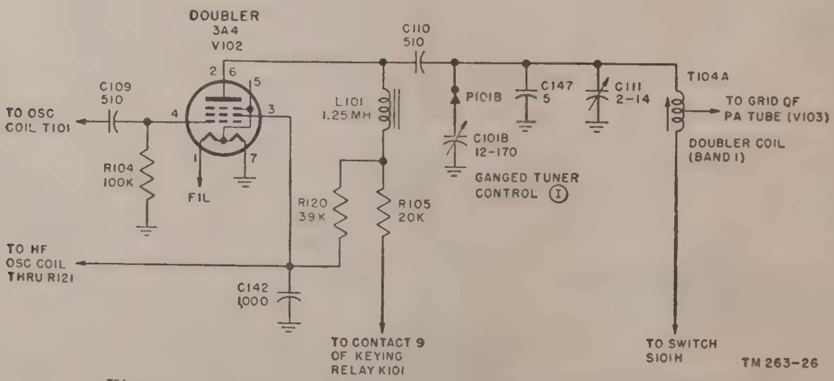

DOUBLER
3A4
V102
C110
510
T104A
C109
510
TO OSC
COIL T101
2
6
5
4
3
1
7
L101
1.25MH
P101B
C147
5
C111
2-14
TO GRID OF
PA TUBE (V103)
C101B
12-170
DOUBLER COIL
(BAND I)
GANGED TUNER
CONTROL Ⓘ
R104
100K
FIL
R120
39K
R105
20K
TO HF
OSC COIL
THRU R121
C142
1000
TO CONTACT 9
OF KEYING
RELAY K101
TO SWITCH
S101H
TM 263-26

Figure 72. Frequency doubler stage V102, simplified schematic.

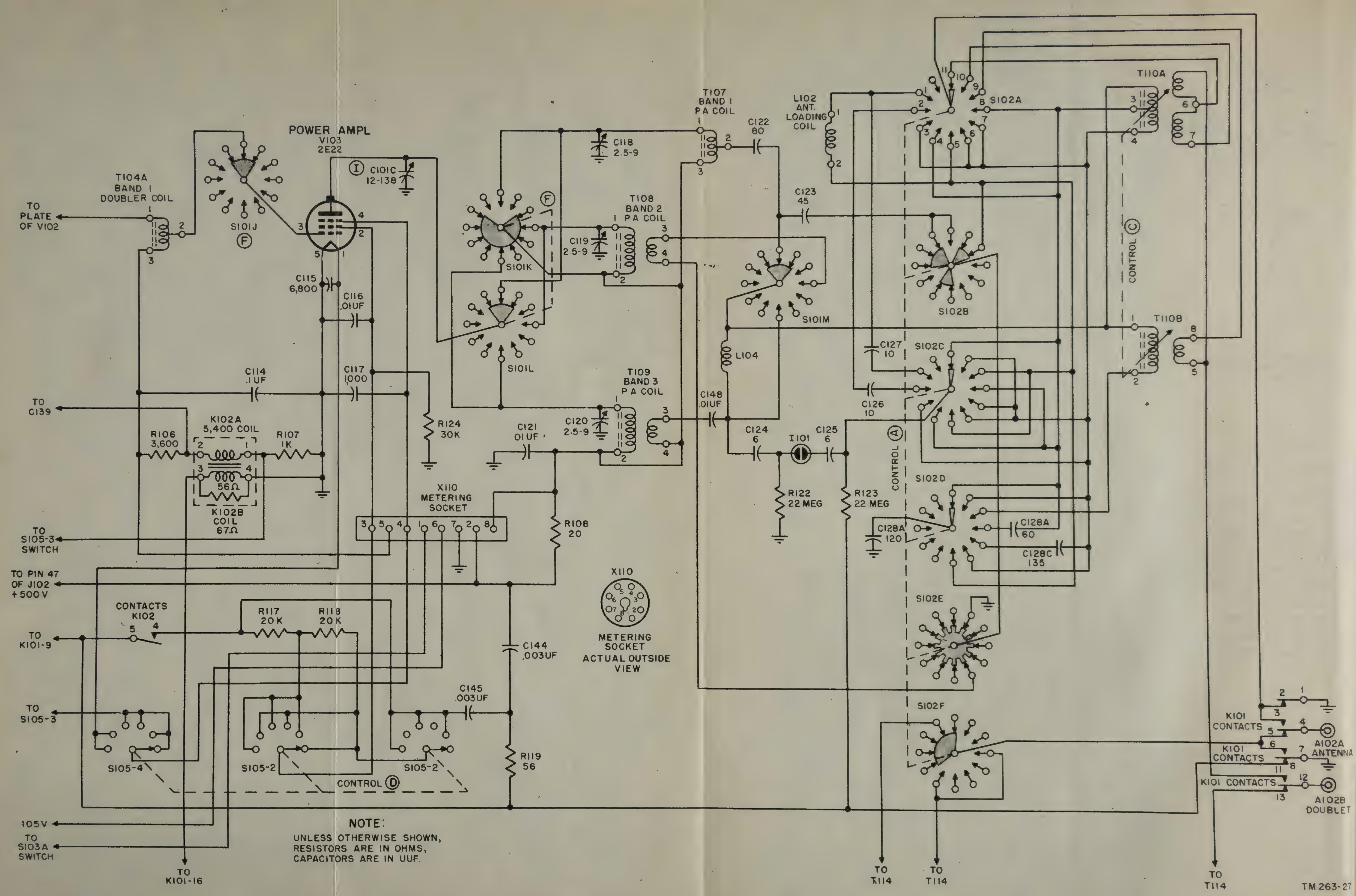
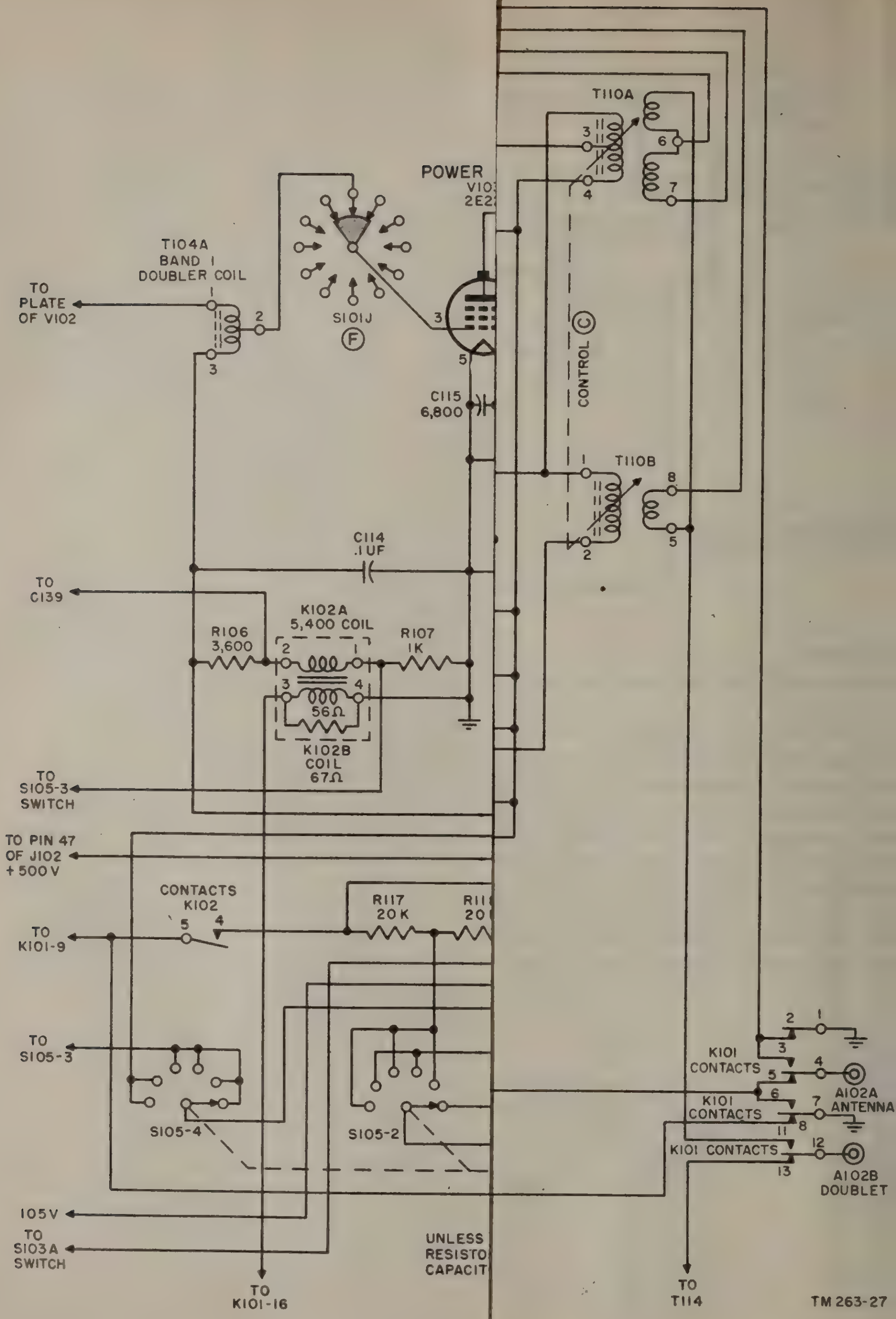

POWER AMPL
V103
2E22
T104A
BAND 1
DOUBLER COIL
TO PLATE OF V102
S101J
F
I
C101C
12-138
C115
6,800
C116
.01UF
C114
.1 UF
C117
1000
TO C139
R106
3,600
K102A
5,400 COIL
R107
1K
56Ω
K102B
COIL
67Ω
R124
30K
TO S105-3 SWITCH
TO PIN 47 OF J102 +500V
CONTACTS
K102
TO K101-9
R117
20K
R118
20K
TO S105-3
S105-4
S105-2
S105-2
CONTROL D
105V
TO S103A SWITCH
TO K101-16
X110
METERING
SOCKET
R108
20
C121
.01UF
C144
.003UF
C145
.003UF
R119
56
X110
METERING SOCKET ACTUAL OUTSIDE VIEW
NOTE:
UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
C118
2.5-9
S101K
S101L
T108
BAND 2
PA COIL
C119
2.5-9
T109
BAND 3
PA COIL
C120
2.5-9
T107
BAND 1
PA COIL
C122
80
C123
45
S101M
L104
C148
.01UF
C124
6
I101
C125
6
R122
22 MEG
R123
22 MEG
L102
ANT.
LOADING
COIL
S102A
S102B
S102C
C127
10
C126
10
CONTROL A
S102D
C128A
120
C128A
60
C128C
135
S102E
S102F
TO T114
TO T114
T110A
T110B
CONTROL C
K101
CONTACTS
K101
CONTACTS
K101 CONTACTS
A102A
ANTENNA
A102B
DOUBLET
TO T114
TM 263-27

Figure 73. Transmitter power amplifier stage V103, simplified schematic.


T110A
3
6
7
4
POWER
V10
2E2
T104A
BAND I
DOUBLER COIL
TO
PLATE
OF V102
1
2
3
S101J
F
3
5
CONTROL C
C115
6,800
1
T110B
8
5
2
C114
.1 UF
TO
C139
K102A
5,400 COIL
R106
3,600
R107
1K
2
1
3
4
56Ω
K102B
COIL
67Ω
TO
S105-3
SWITCH
TO PIN 47
OF J102
+500 V
CONTACTS
K102
5
4
R117
20 K
R11
20
TO
K101-9
TO
S105-3
S105-4
S105-2
K101
CONTACTS
K101
CONTACTS
K101 CONTACTS
2
1
3
4
5
6
7
8
11
12
13
A102A
ANTENNA
A102B
DOUBLET
105 V
TO
S103A
SWITCH
UNLESS
RESISTO
CAPACIT
TO
K101-16
TO
T114
TM 263-27

c. Resistor R102 is still the grid bias resistor as in MO operation, while capacitor C105 is the grid leak capacitor. R104 is an r-f decoupling resistor.

d. Capacitor C129, which connects from the tube plate to the crystal, is used to provide degenerative feedback from the plate circuit to the crystal. This circuit allows crystals of a wide range of activities to be used. The plate circuit is tuned to the crystal frequency desired by capacitor C101A, control Ⓘ.

e. Tube V101 is in operation only when the key is depressed or the press-to-talk switch on the microphone is pushed. This is so because V101 derives its plate and screen voltage through keying relay K101 and the relay is actuated only when the microphone or key is in use. Tube V101 also operates on the NET position of control Ⓛ, regardless of the position of relay K101.

94. Frequency Doubler V102, Tube Type 3A4
(fig. 72)

a. The output of the oscillator V101 is coupled by capacitor C109 to the frequency doubler stage V102, which uses a tube type 3A4.

b. The doubler is operated as a Class C amplifier and is adjusted to distort the frequency input to its grid. The tuned tank coil in the plate circuit is tuned to resonance at a frequency just twice that of the incoming oscillator signal and, therefore, selects only the second harmonic of the oscillator output to pass on to the power amplifier.

c. The output of the oscillator stage is coupled to the control grid of the doubler stage by capacitor C109 and grid return resistor R104. The load in the plate circuit of V102 consists of a parallel resonant circuit, using T104 which is slug-tuned, alinement capacitor C111, fixed capacitor C147, and ganged tuning capacitor C101B. Capacitor C101B is connected to the transmitter through plug P101B by means of which it may be easily removed from the transmitter for replacement. Capacitor C110 is used to block the d-c plate voltage from the tuned circuit.

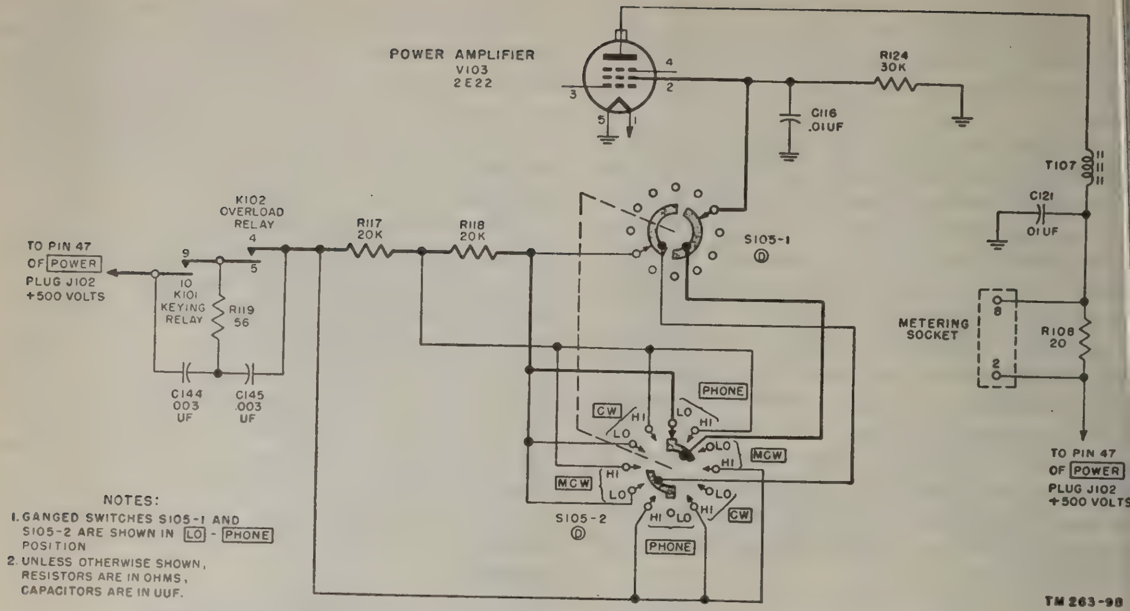
d. The plate of V102 is shunt-fed through choke coil L101 in series with dropping resistor R105. The voltage to the screen is made lower than the plate voltage by means of dropping resistor R120. The combination of R120 and R105 is bypassed to ground, for r-f screen current, through capacitor C142. Plate and screen voltages to the doubler are cut off when the keying relay is open. When the key is depressed, the relay closes and the doubler then receives voltage for operation.

e. From the main schematic (fig. 139), it can be seen that switches S101H, S101I, and S101J are associated with the doubler tuned circuits. These are part of control Ⓕ on the transmitter panel. There are three plate coils, one for each of the three transmission bands. Switch S101I determines which of these coils is connected to the plate of tube V102. Switch S101H shorts out the other two coils that are not being used. Switch S101J connects the doubler output from the coil in use to the grid, pin 3, of the power amplifier tube V103. All these switches are ganged.

95. Power Amplifier Stage V103,
Tube Type 2E22
(fig. 73)

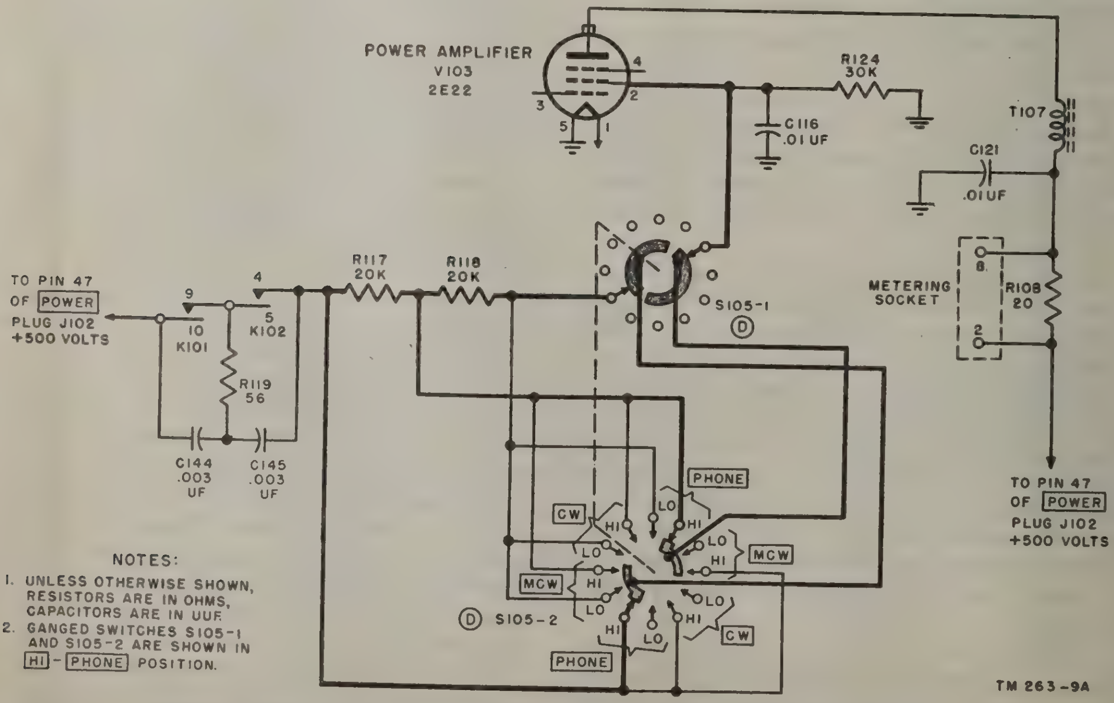
a. GENERAL. In order that the antenna receive sufficient power for radiation of the signal, a power amplifier is coupled between the voltage doubler and the antenna. This amplifier is operated Class C. Modulation of the signal takes place in the power amplifier stage. Three types of signal are possible: cw, mcw, and phone. The process by which modulation is accomplished is the variance of the *suppressor grid* voltage by means of a modulator tube, and is explained more fully in paragraph 97.

b. SIGNAL PATH. The signal enters the amplifier grid, pin 3, directly from the plate load coil of the preceding doubler stage V102, through the switch S101J. After amplification by the tube the signal leaves the plate and enters one of the tuned tank circuits selected by band switch S101L, control Ⓕ. Since the transmitter is designed to operate with a whip, long-wire, or doublet (with a 72-ohm transmission line) antenna, it is necessary to provide the correct matching circuit for maximum power transfer. Thus S101M, which selects the output from the plate coil in use, leads the signal to switches S102A, B, C, D, and E, control Ⓐ. This last bank of switches selects the proper matching circuits for the antenna being used. After the signal has


POWER AMPLIFIER
V103
2E22
4
2
3
5
1
R124
30K
C116
.01UF
T107
C121
.01UF
K102
OVERLOAD
RELAY
4
5
9
10
K101
KEYING
RELAY
R117
20K
R118
20K
S105-1
D
TO PIN 47
OF POWER
PLUG J102
+500 VOLTS
R119
56
C144
.003
UF
C145
.003
UF
METERING
SOCKET
8
2
R108
20
PHONE
CW
HI
LO
MCW
S105-2
D
TO PIN 47
OF POWER
PLUG J102
+500 VOLTS
TM 263-9B

NOTES:
1. GANGED SWITCHES S105-1 AND S105-2 ARE SHOWN IN LO - PHONE POSITION
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 74. Power amplifier screen grid circuits arranged for LO (low) power operation.


POWER AMPLIFIER
V103
2E22
4
2
3
5
1
R124
30K
C116
.01 UF
T107
C121
.01 UF
TO PIN 47
OF POWER
PLUG J102
+500 VOLTS
9
4
10
K101
5
K102
R117
20K
R118
20K
S105-1
D
R119
56
C144
.003
UF
C145
.003
UF
METERING
SOCKET
8
2
R108
20
PHONE
CW
HI
LO
MCW
D S105-2
TO PIN 47
OF POWER
PLUG J102
+500 VOLTS
TM 263-9A

NOTES:
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. GANGED SWITCHES S105-1 AND S105-2 ARE SHOWN IN HI - PHONE POSITION.

Figure 75. Power amplifier screen grid circuits arranged for HI (high) power operation.

been led to the proper transformer T110A or B, it goes to contacts 3 and 11 of keying relay K101, and when the key or microphone is in use, it is fed to the antenna and radiated out into space.

c. SIGNAL GRID CIRCUIT. Switch S101J selects the output of the doubler coil for the band in use and applies this output to the grid, pin 3, of the power amplifier. The grid return is through resistor R106, relay coil K102A, and resistor R107. The d-c bias for the tube is developed across these three items, while they are bypassed for r-f by capacitor C114. Pin 1 of the filament is bypassed to pin 5 of the filament with capacitor C115. Capacitor C115 bypasses to ground the unwanted r-f pickup of the lead connected to pin 1. Relay coil K102A has its contacts in the screen grid circuit and should grid excitation fail, these contacts open, removing voltage from the screen and preventing destruction of the tube (*f* below).

d. SCREEN GRID CIRCUIT, HI AND LO POWER (fig. 74).

(1) The power output of the power amplifier is controlled by varying the screen grid voltage. R124, the screen grid bleeder, stabilizes the screen grid voltage. There are two possible levels of output; HI and LO power, and these are selected by switches S105–1 and S105–2, control ⑥. If the weighted line in figure 74 is followed from the screen grid, pin 2 of V103, it will be seen that the screen current passes through S105–1 and S105–2 to the series combination of resistors R117 and R118, and then to the power supply through the contacts of relays K102 and K101. This series arrangement of the two resistors is the LO power circuit since the screen of V103 is at a low potential because of the large drop across the series combination of R117 and R118. When HI power output is desired, ganged switches S105–1 and S105–2 are turned to HI and R117 is then placed in parallel with R118 (fig. 75). There is less voltage drop across the parallel combination than the series combination and thus the screen grid has more voltage placed upon it. The screen grid voltage determines, to a large extent, the current through the tube and therefore the power output.

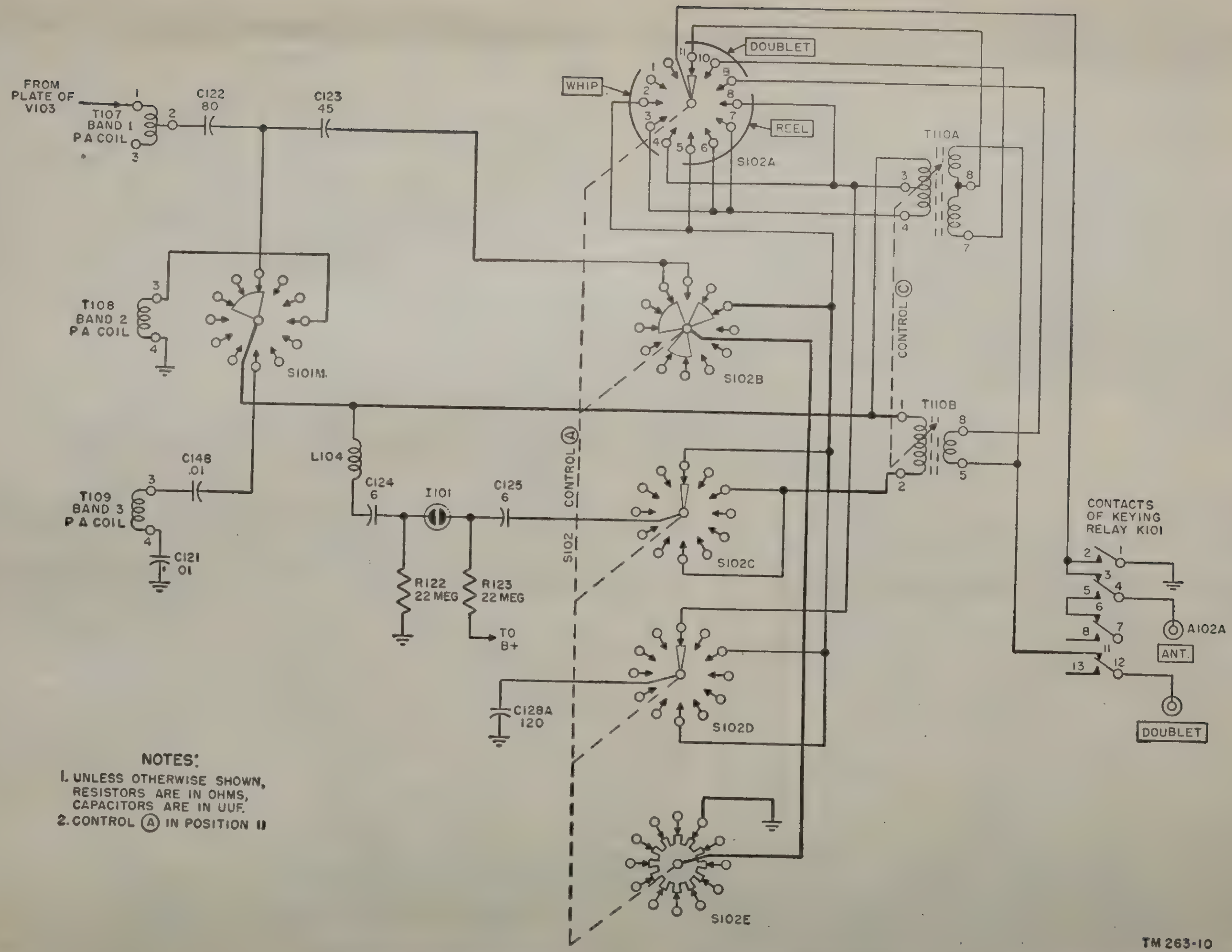
(2) Resistor R124 forms a voltage divider system with the combination of R117 and R118 across the power supply, and the screen grid receives its voltage from across R124. Capacitor C116 is the screen grid bypass which is used to bypass r-f currents directly to ground, and not through the screen supply circuit.

e. SCREEN CIRCUIT CUT-OUT RELAYS. The contacts of two different relays are in series with the screen to open or close the circuit. Relay K101 is controlled by the keying circuit and is normally open, so that the screen grid does not receive any voltage and the power output of the power amplifier stage is almost zero. This makes the transmitter inoperative while the receiver is being listened to. However, when the key is depressed or the press-to-talk switch on the microphone is pushed, relay coil K101 is energized and contacts 9 and 10 in the screen circuit of V103 are closed. These contacts permit screen current to flow and the transmitter is then in operation.

f. RELAY K102A. The contacts of relay K102A are located in series with the screen grid, but the relay coil is in series with the control grid, pin 3 of V103 (fig. 139). Thus, the direct current in the control grid circuit flows through the relay, keeping contacts 4 and 5 closed during transmitter operation. Should the signal grid excitation be cut off for any reason, the grid current would cease and the relay would no longer be energized; the contacts in the screen circuit would open and the screen would no longer receive any voltage. This arrangement, which cuts off screen grid voltage when excitation fails, is necessary to prevent damage to the power amplifier tube and circuit. The tube is a Class C amplifier with 500 volts on the plate, and the negative grid bias is developed solely by the d-c grid current. Therefore, if the grid excitation should fail, there would be no negative bias on the grid. This would result in a plate current large enough to ruin the tube.

g. RELAY COIL K102B.

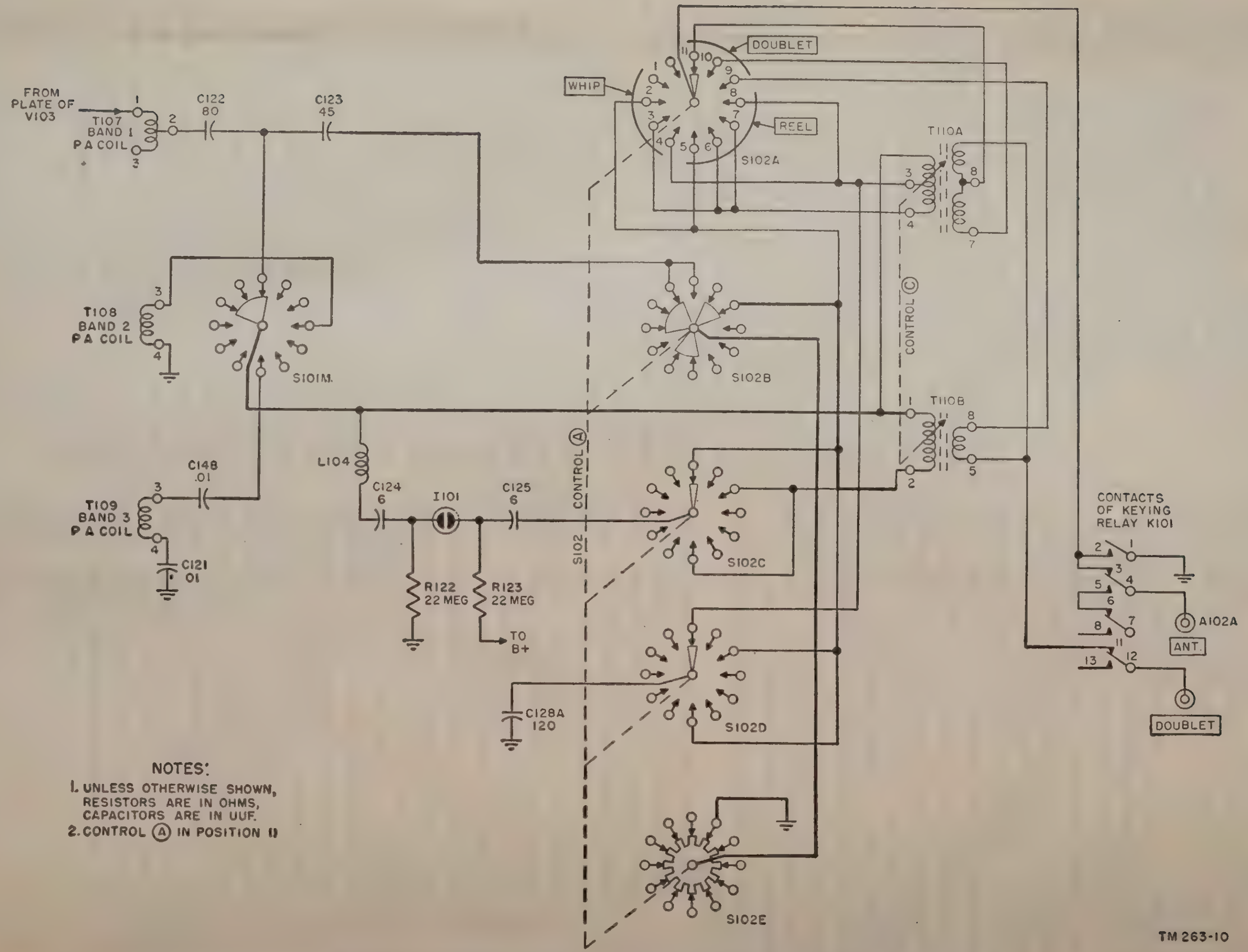
(1) Relay coil K102B is placed on the same iron core as section K102A. One


FROM PLATE OF V103
T107 BAND 1 PA COIL
1
2
3
C122 80
C123 45
T108 BAND 2 PA COIL
3
4
S101M.
T109 BAND 3 PA COIL
3
4
C148 .01
C121 01
L104
C124 6
I101
C125 6
R122 22 MEG
R123 22 MEG
TO B+
C128A 120
S102 CONTROL Ⓐ
WHIP
DOUBLET
REEL
S102A
1
2
3
4
5
6
7
8
9
10
11
S102B
S102C
S102D
S102E
T110A
3
4
8
7
CONTROL Ⓒ
T110B
1
2
8
5
CONTACTS OF KEYING RELAY K101
1
2
3
4
5
6
7
8
11
12
13
A102A
ANT.
DOUBLET
TM 263-10

NOTES:

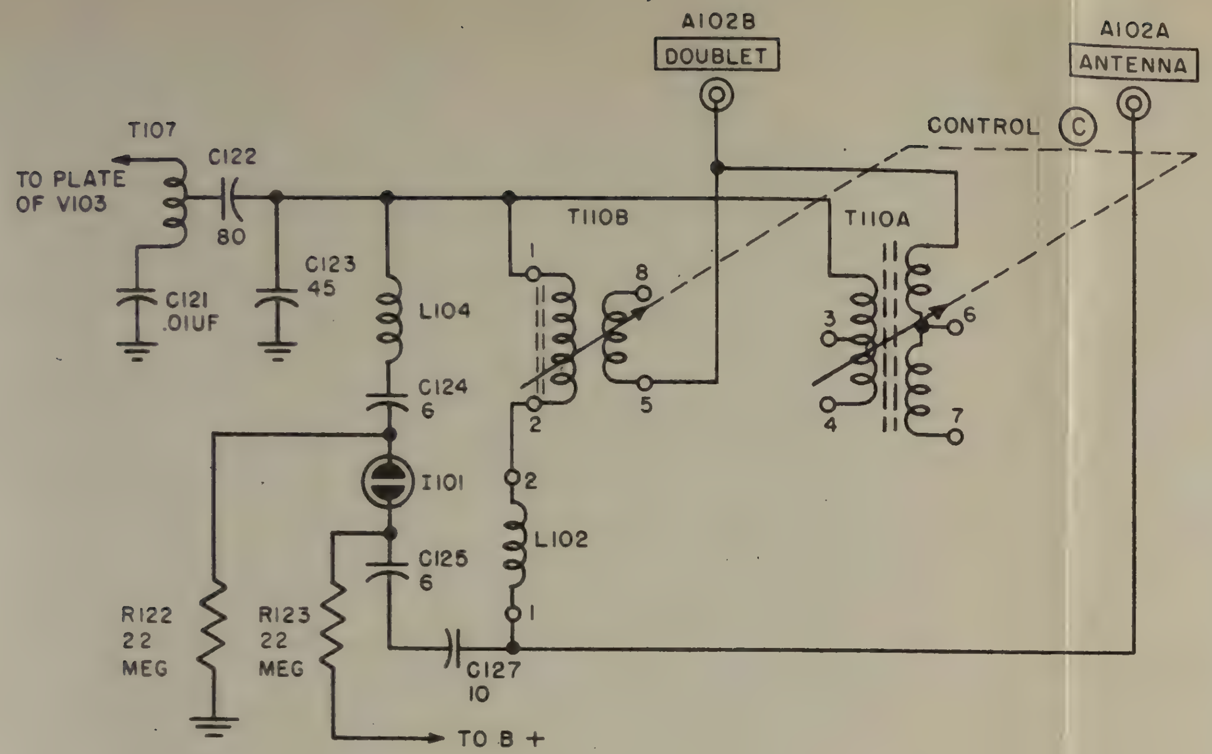
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. CONTROL Ⓐ IN POSITION 11

Figure 76. Antenna switching and tuning circuits for transmitter.

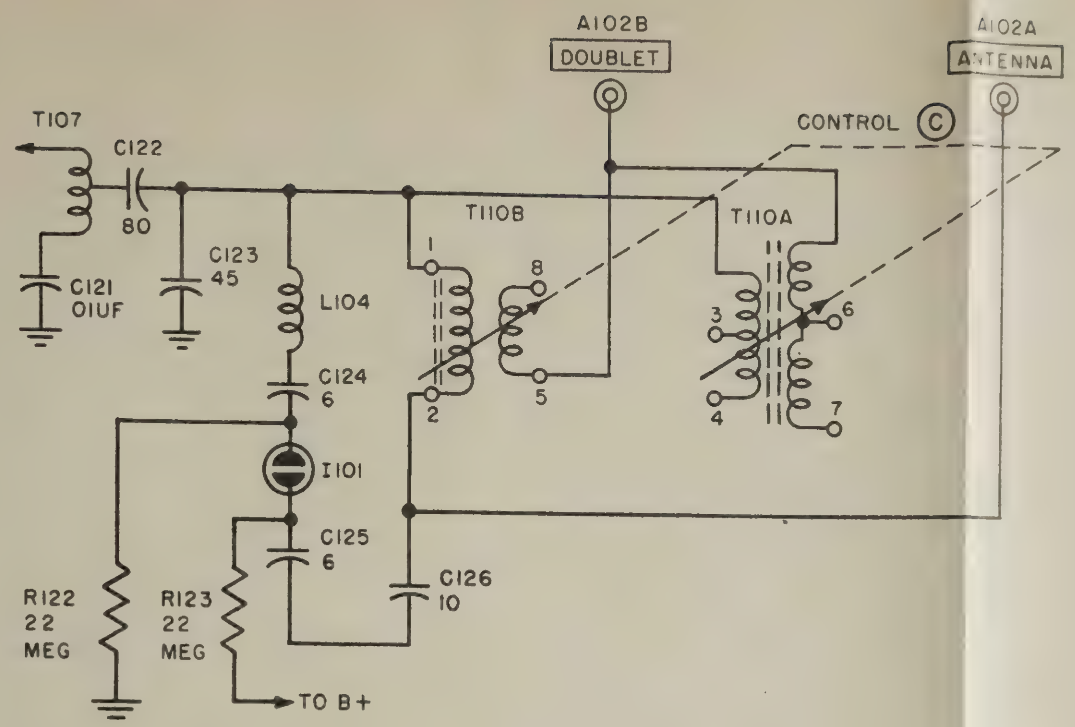

FROM PLATE OF V103
T107 BAND 1 PA COIL
1
2
3
C122 80
C123 45
T108 BAND 2 PA COIL
3
4
S101M.
T109 BAND 3 PA COIL
3
4
C148 .01
C121 .01
L104
C124 6
I101
C125 6
R122 22 MEG
R123 22 MEG
TO B+
C128A 120
S102 CONTROL Ⓐ
WHIP
DOUBLET
REEL
S102A
1
2
3
4
5
6
7
8
9
10
11
S102B
S102C
S102D
S102E
T110A
3
4
8
7
CONTROL Ⓒ
T110B
1
2
8
5
CONTACTS OF KEYING RELAY K101
1
2
3
4
5
6
7
8
11
12
13
A102A
ANT.
DOUBLET
TM 263-10

NOTES:
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. CONTROL Ⓐ IN POSITION 11

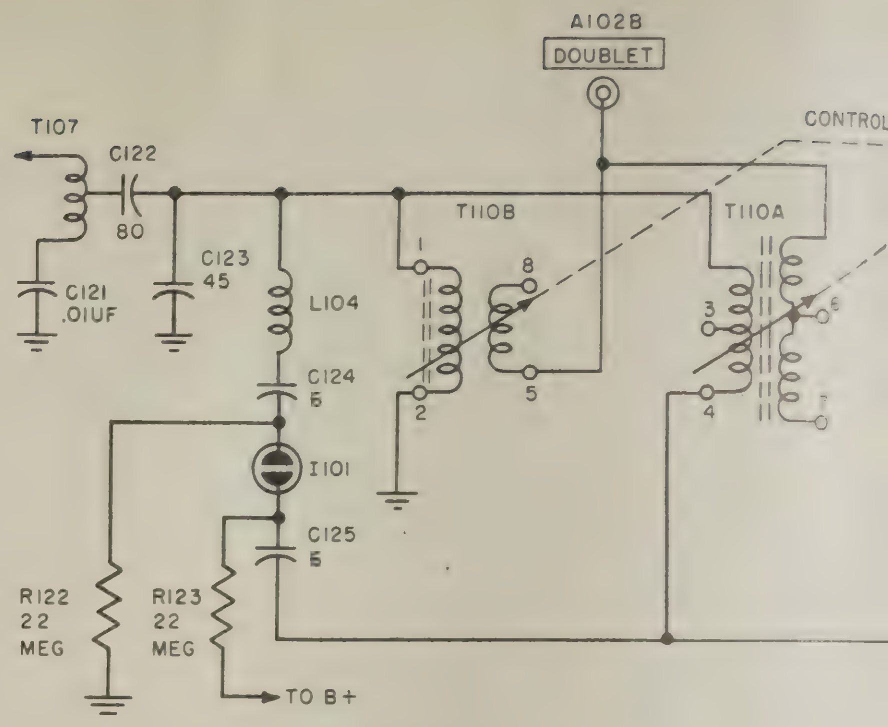
Figure 76. Antenna switching and tuning circuits for transmitter.


A102B
DOUBLET
A102A
ANTENNA
CONTROL
C
T107
TO PLATE OF V103
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
I101
C125
6
L102
R122
22
MEG
R123
22
MEG
C127
10
TO B +

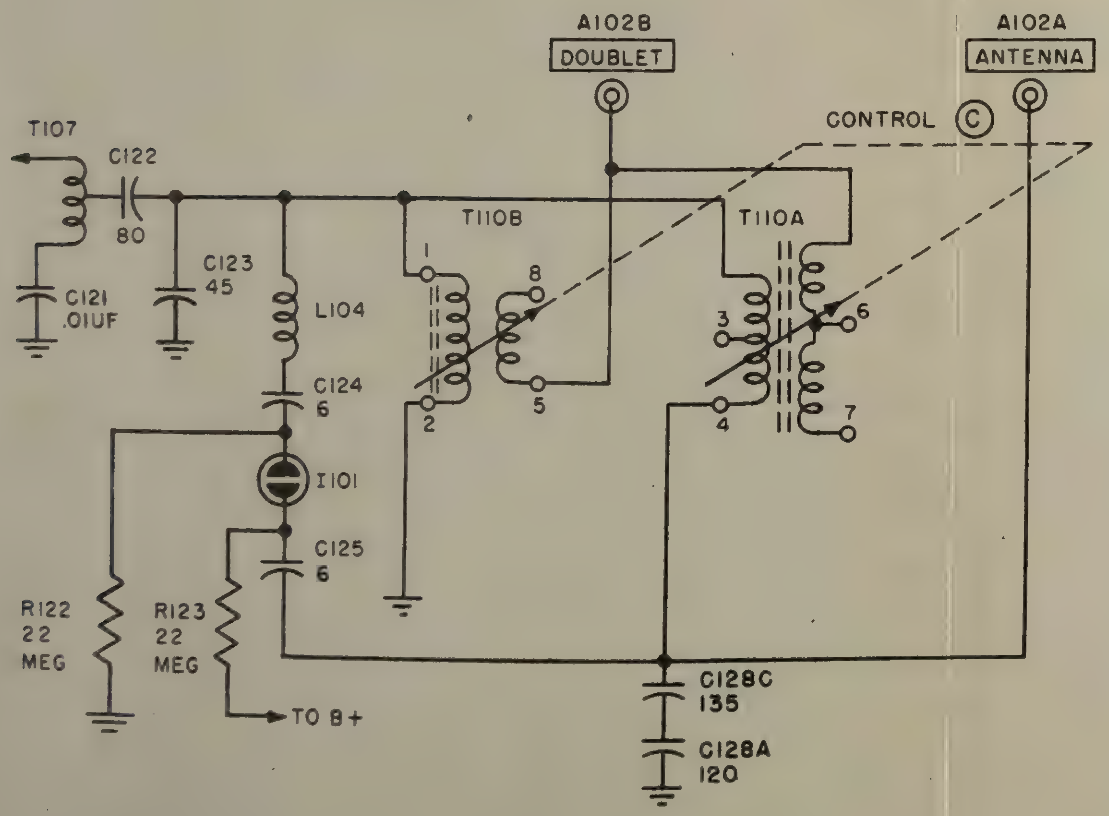
WHIP ① POSITION


A102B
DOUBLET
A102A
ANTENNA
CONTROL
C
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
I101
C125
6
C126
10
R122
22
MEG
R123
22
MEG
TO B+

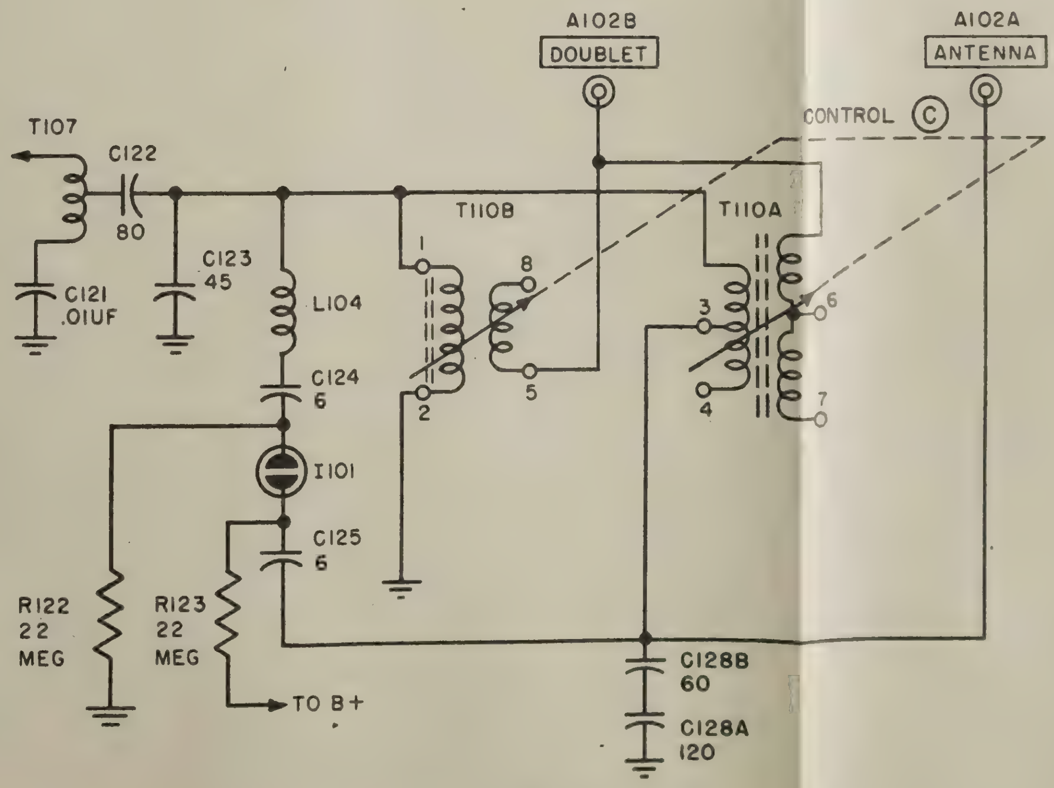
WHIP ② POSITION


A102B
DOUBLET
CONTROL
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+

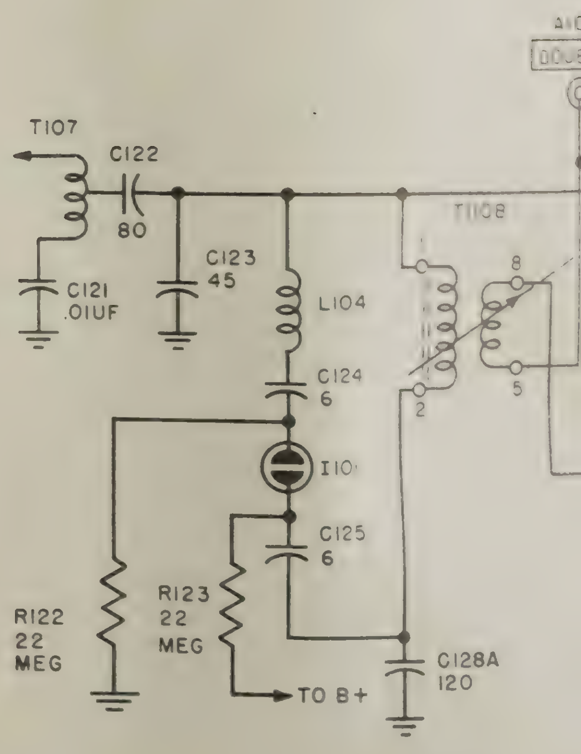
WHIP ③ POSITION


A102B
DOUBLET
A102A
ANTENNA
CONTROL
C
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128C
135
C128A
120

REEL ⑦ POSITION

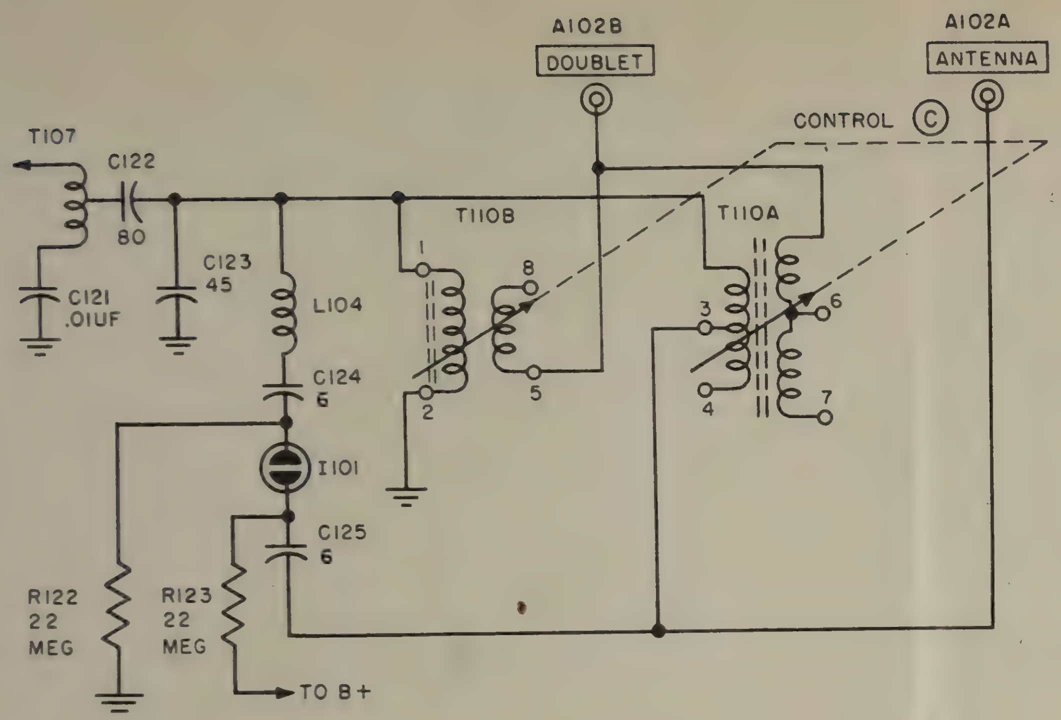

A102B
DOUBLET
A102A
ANTENNA
CONTROL
C
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128B
60
C128A
120

REEL ⑧ POSITION


T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128A
120

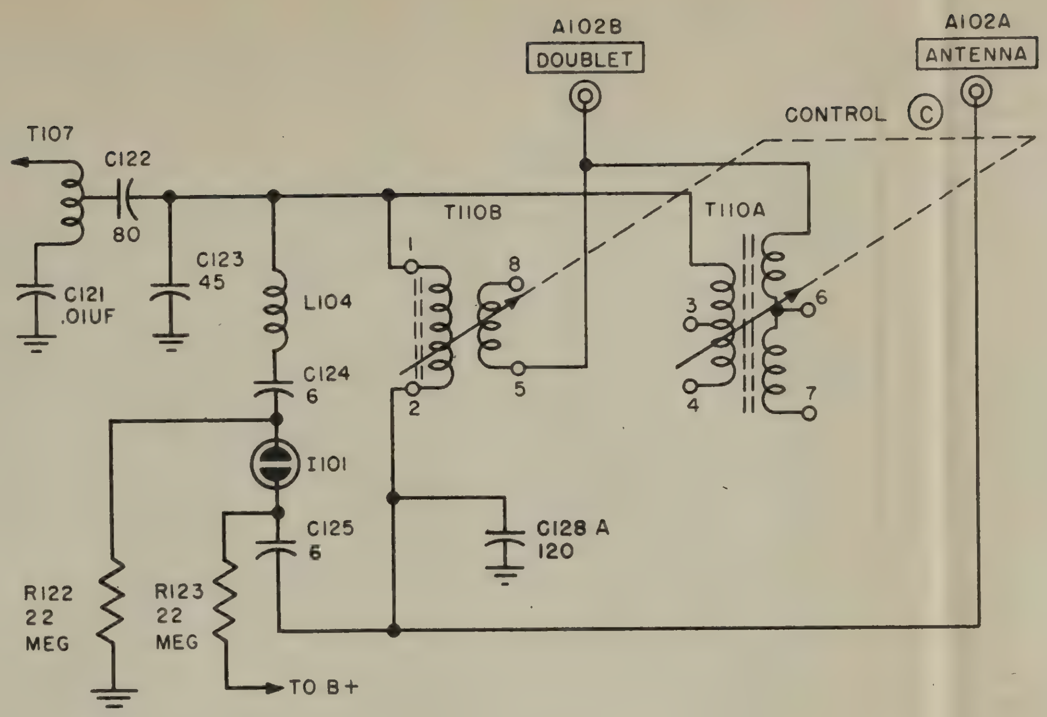
DOUBLET ⑨

Figure 77 An
simpl



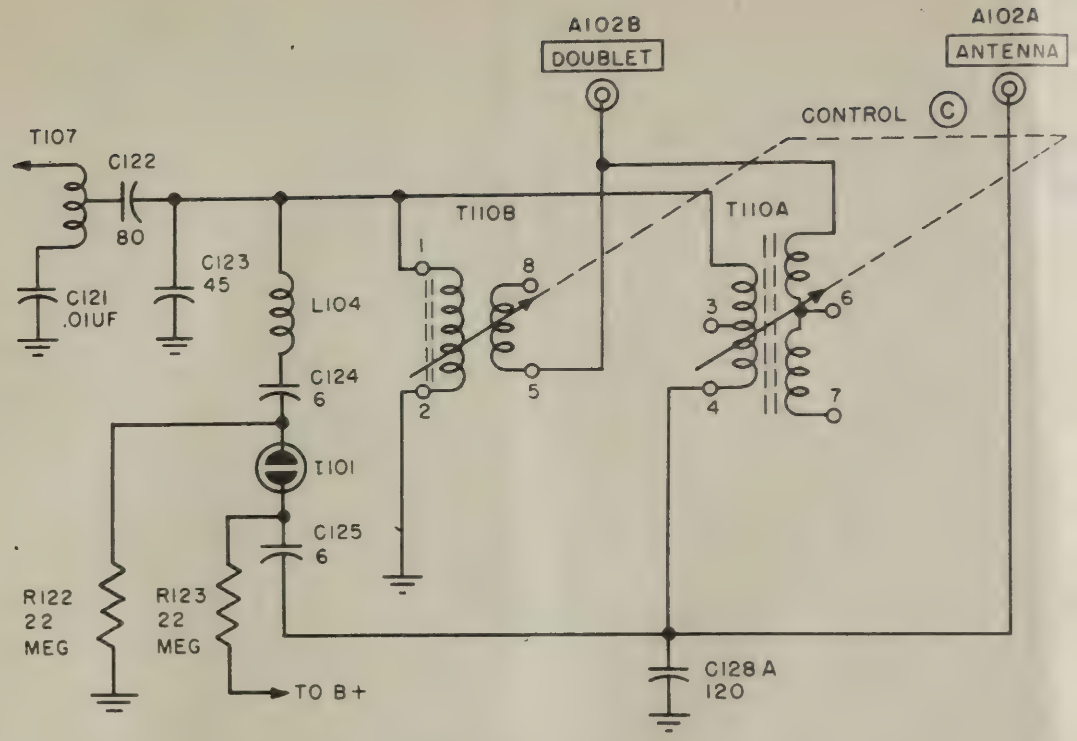
A102B
DOUBLET
A102A
ANTENNA
CONTROL Ⓒ
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
1
2
8
5
3
4
6
7
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+

WHIP ④ POSITION



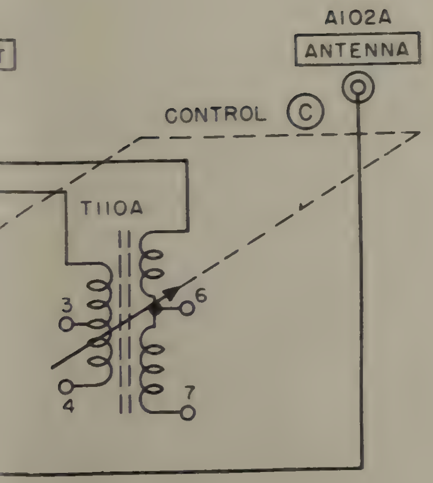
A102B
DOUBLET
A102A
ANTENNA
CONTROL Ⓒ
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
1
2
8
5
3
4
6
7
I101
C125
6
C128 A
120
R122
22
MEG
R123
22
MEG
TO B+

REEL ⑤ POSITION

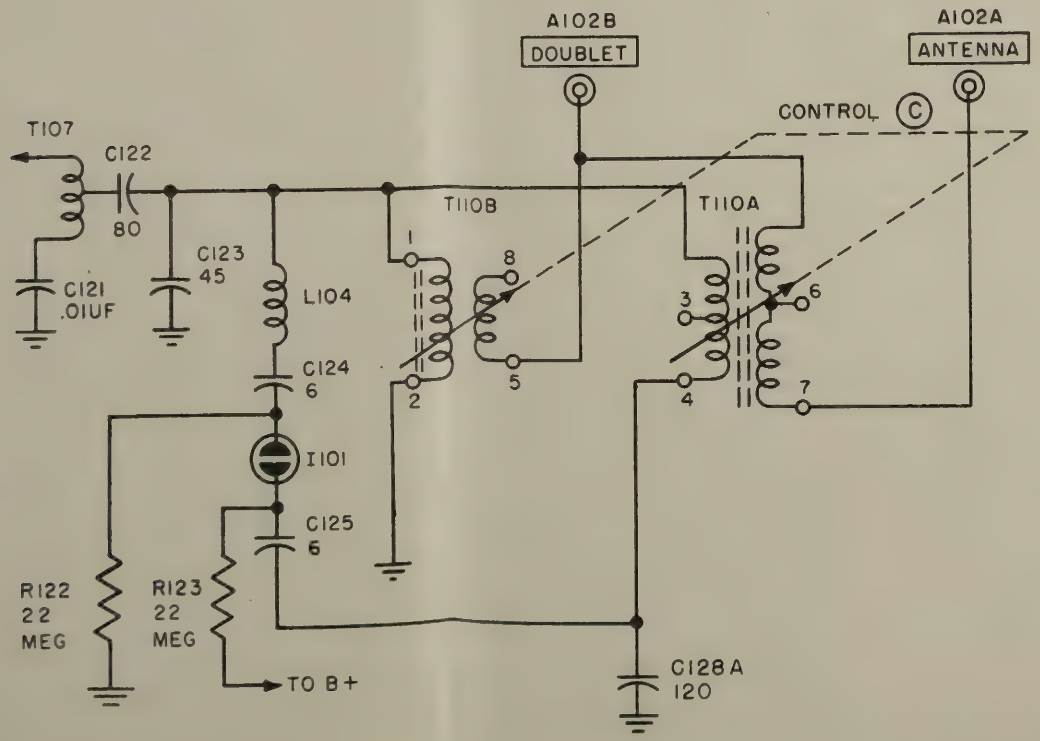


A102B
DOUBLET
A102A
ANTENNA
CONTROL Ⓒ
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
1
2
8
5
3
4
6
7
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128 A
120

REEL ⑥ POSITION

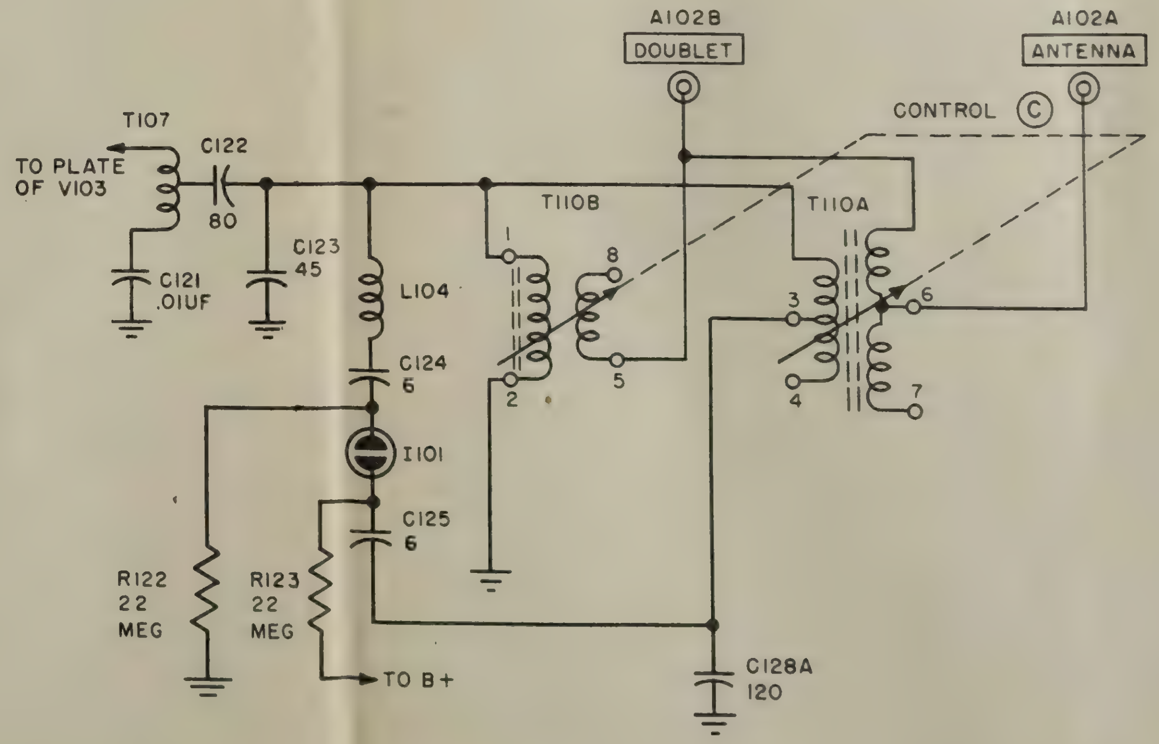


A102A
ANTENNA
CONTROL Ⓒ
T110A
3
4
6
7



A102B
DOUBLET
A102A
ANTENNA
CONTROL Ⓒ
T107
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
1
2
8
5
3
4
6
7
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128A
120

DOUBLET ⑩ POSITION



A102B
DOUBLET
A102A
ANTENNA
CONTROL Ⓒ
T107
TO PLATE OF V103
C122
80
C123
45
C121
.01UF
L104
C124
6
T110B
T110A
1
2
8
5
3
4
6
7
I101
C125
6
R122
22
MEG
R123
22
MEG
TO B+
C128A
120

DOUBLET ⑪ POSITION

NOTES:

1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2. IN LATER MODELS, R123 IS GROUNDED AND B+ IS FED TO R122 INSTEAD OF R123.

ITION

TM 263-11

a switching and tuning circuits for transmitter,
schematic for positions of switch S102.

end of K102B connects to ground. The other end leads through contacts 15 and 16 of keying relay K101 (fig. 139) to switch S103A, which connects to the 6.3-volt regulated supply voltage. Contacts 15 and 16 are closed only when the receiver is being operated and, therefore, coil K102B is energized only when the receiver is operating. Thus, there is some magnetism in the iron core even when the transmitter is not in use, as when the key is up, or when the press-to-talk switch in the microphone is not depressed.

(2) As soon as the key is pressed down, a small signal current starts to flow in the power amplifier grid circuit, causing coil K102A to be energized and contacts 4 and 5 to close. Because coil K102B had already been energized and the iron core magnetized when the key was up, it is possible for the signal current through K102A to be only a very small value to close contacts 4 and 5. Therefore, more rapid keying is allowed since, almost immediately upon key closure, coil K102A has enough energy to close the power amplifier screen grid circuit.

(3) If coil K102A had to magnetize the iron core from a point of zero magnetism, there would be an appreciable time lag until the current through K102A became great enough to produce a magnetic field strong enough to close contacts 4 and 5.

h. ARC SUPPRESSION. When the contacts of relays K101 and K102 open, arcs are formed which create r-f disturbances, called *key-clicks*, in addition to damaging the contacts. These arcs can not be eliminated but the length of their duration with each opening of the contact can be shortened considerably by means of a suitable filter or arc suppression circuit. This is the function of capacitors C144 and C145 and resistor R119 (fig. 75).

i. PLATE CIRCUIT (fig. 73). The signal from the plate of V103 enters the coil selector switch S101L, control Ⓕ. Coil T107, T108, or T109 may be selected, depending on the band of transmission desired. Capacitor C101C is the main tuning capacitor for the coil selected and is ganged to the other tuning capacitors, control Ⓘ, for the preceding stages. Switch S101K shorts out those tuning coils which are not in use. Considering band 1, capacitor C118 is the alinement trimmer. The bottom of each coil is connected to resistor R108 and from there directly to the 500-volt d-c supply (fig. 73). Two leads are connected from across R108 to the metering socket. This is a means whereby the current in the plate circuit can be measured. Capacitor C121 is the bypass for R108, and places the lower end of coils T107, T108, and T109 at ground r-f potential.

96. Antenna Switching and Tuning Circuits for Transmitter

(fig. 76)

a. There are 11 possible positions for ganged switch bank S102, control Ⓐ (fig. 76). Only switches A through E enter into transmitter operation. Section F is for receiver operation only. These 11 different positions are necessary so that the antenna will be matched to the power amplifier output coil for maximum power transfer throughout the entire frequency range of the transmitter. The functions of the different switch positions are:

(1) Positions 1, 2, 3, and 4 match the power amplifier coil to a vertical mast or whip antenna for all frequencies.

(2) Positions 5, 6, 7, and 8 match the power amplifier coil to an end-fed antenna for all frequencies.

(3) Positions 9, 10, and 11 match the power amplifier coil to a center-fed or doublet antenna for all frequencies.

Note. Figure 77 shows, in simplified form, the different circuit elements connected for each of the 11 distinct positions of control Ⓐ.

b. The whip or long-wire antenna when connected to the ANT. post can be considered as an impedance to ground. For positions 1 through 8 of control Ⓐ, the antenna is in series with the primary of either transformer T110A or T110B and this series circuit is in parallel with a portion of coil T107. In position 1 only, loading coil L102 is added to the series combination. In positions 6, 7, and 8 additional capacity is placed in parallel with the antenna by means of capacitor C128A, C128B, or C128C. For the doublet circuit, positions 9, 10, and 11, the primary of transformer T110A or T110B is completed to ground through capacitor C128A.

c. Control Ⓒ is an adjustable powdered iron core that slides within coils T110A and T110B, tuning them to resonance. Indicator I101 is a small neon bulb which, by means of its highest brilliance, indicates when control Ⓒ has tuned the antenna coils to resonance. Figure 77 shows that the neon bulb is in series with coil L104, capacitor C124, and capacitor C125. This high-impedance series combination is placed across the primary of either transformer T110A or T110B, depending on the switch position of control Ⓐ. Thus the r-f voltage across the primary coil is impressed across this series circuit and this causes a voltage to appear across the neon indicator. The indicator glows at brillia which is roughly proportional to the r-f volt across the primary coil, and is therefore an dication of how closely the transformer is tu to resonance. Resistors R122 and R123 are series with the neon indicator bulb and t series combination is placed across the 500-v d-c line, when contacts 9 and 10 of relay K1 close. This arrangement is necessary to provi a break-down voltage so that the neon tube w be ready to light as soon as enough r-f volta is put across it. The d-c is thus like a keep-ali voltage.

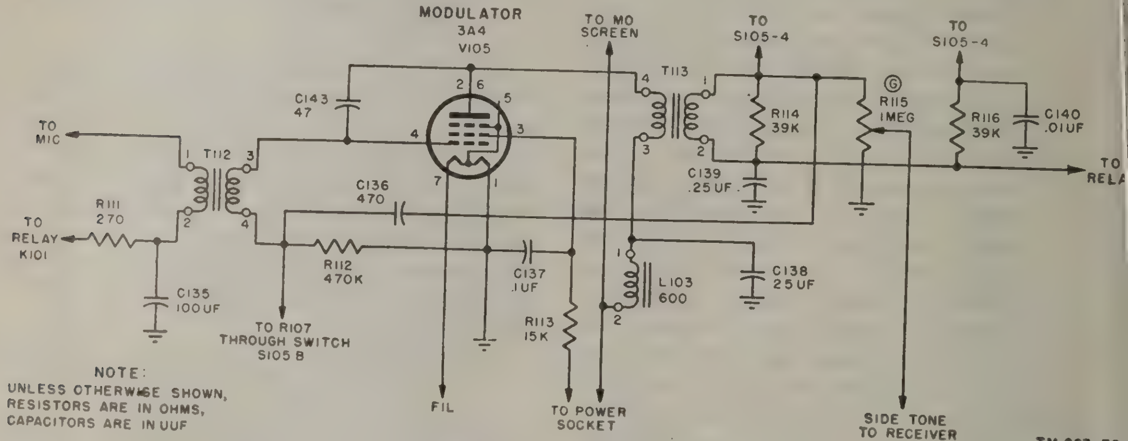

MODULATOR
3A4
V105
TO MO SCREEN
TO S105-4
TO S105-4
T113
Ⓖ
R115
1MEG
R114
39K
R116
39K
C140
.01UF
C139
.25 UF
C143
47
TO MIC
T112
R111
270
TO RELAY K101
C136
470
R112
470K
C137
.1UF
C135
100UF
L103
600
C138
25UF
R113
15K
TO RELA
TO R107 THROUGH SWITCH S105 B
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
FIL
TO POWER SOCKET
SIDE TONE TO RECEIVER
TM 263-79

Figure 78. Modulator stage V105. simplified schematic.

97. Modulator Stage V105, Tube Type 3A4
(fig. 78)

a. GENERAL. The modulator circuit develops the audio voltage to suppressor-grid modulate the power amplifier during phone and mcw operation. These audio variations from the microphone are fed from the matching transformer T112 to the control grid of V105; they are amplified and appear across the modulation transformer T113. If the suppressor grid circuit of the power tube is traced on the main schematic (fig. 139) from pin 4 of V103, it will be seen that it goes through switch S105-4 to resistor R114, which is connected across the secondary of the modulation transformer. The other end of R114 connects to relay coil K102A in series with resistor R107 to the grounded filament lead of the power tube. Thus, the modulation voltage is in series with the negative voltage on the suppressor grid, developed by the control grid current through K102A and resistor R107. The modulation voltage, therefore, varies the voltage on the suppressor grid in accordance with the intelligence in the microphone, and the suppressor voltage determines to a large extent the plate current of the power amplifier.

b. PHONE OPERATION.

(1) If the signal grid lead from pin 4 of modulator tube V105 is traced, it will be found that terminal 4 of T112 connects to switch S105–3 which, in the PHONE position only, leads to resistor R107 in the signal grid circuit of power amplifier tube V103 and from there to ground (fig. 139). The grid current of V103 develops a voltage across R107 and since this resistor is also in the grid circuit of V105, tube

V105 is also biased to its correct operating point by this resistor.

(2) The modulator tube receives its plate voltage through the decoupling filter composed of L103 and capacitor C138. This filter is connected to the power supply through contacts 17 and 18 of keying relay K101. Thus, unless the key of the microphone button is depressed, the contacts are open and the modulator does not receive any plate voltage.

(3) The screen receives its voltage from dropping resistor R113 which connects to terminal 7 on receptacle J106 (see main schematic). Terminal 7 on J106 is connected to terminal 2 on J106 by means of connections through circuits located inside the receiver cabinet (fig. 81). Terminal 2 is connected to B+ through contacts 17 and 18 of keying relay K101. Thus the screen voltage depends, as with the plate, on the position of the keying relay. If the key is up, there is no screen or plate voltage on the modulator tube. Capacitor C137 is the screen bypass capacitor.

c. MCW OPERATION. During mcw operation, the fixed bias which the modulator tube received from the power amplifier grid circuit is no longer present because the connection is broken by means of switch S105–3 (see main schematic). Therefore, the modulator tube becomes an audio oscillator due to the positive feedback through capacitor C136 and C143. The tube then develops its own bias across R112 of just the right value to sustain oscillations. Resistor R116 is placed across the output of the modulation transformer T113 by switch S105–4 to adjust circuit conditions for oscillation. No change is made in the connection to the suppressor grid of V103 and, therefore, the transmitter signal is modulated by the audio oscillations of the modulator tube and a mcw is radiated from the antenna.

d. C-W OPERATION (fig. 139). For c-w operation, the modulator tube does not receive any grid bias from the power amplifier tube and, therefore, continues to operate as an audio oscillator. However, switch S105–4 connects the suppressor grid of V103 directly to the positive side of the filament of V103, and disconnects it from the modulator tube. Thus, the signal radiated is c-w without any modulation. Although the modulator tube no longer modulates the radiated signal, it still oscillates to provide a sidetone signal.

98. Sidetone Monitoring Circuit

a. A sidetone circuit in the transmitter permits the operator to monitor his transmissions on phone, mcw, or c-w. The sidetone signal is obtained directly from the modulator and, therefore, does not depend on the r-f power transmitted. It is possible to hear a sidetone even though there may be no r-f power transmitted. Potentiometer R115, control Ⓒ, across the secondary of the modulation transformer, adjusts the volume of the sidetone signal delivered to the receiver through pin 1 of plug J106 on the transmitter, cable 3E7173-22 in the case, and pin 1 of plug J3 in the receiver.

b. When transmitting mcw or c-w, the modulator tube operates as an audio oscillator, furnishing the sidetone. The keying relay interrupts the plate voltage of the modulator tube at the same time that it interrupts the plate circuit of the master oscillator, doubler, and the screen circuit of the power amplifier. The relay thus keys the sidetone oscillator in synchronism with the transmitted signals. When switch S3–3 (control Ⓛ on the receiver) is turned to NET or CAL. the sidetone oscillator is made inoperative by the removal of the screen voltage. This prevents sidetone from interfering with zero beating of the transmitter to the receiver.

99. Microphone and Key Connections (fig. 79)

a. Both the microphone and the key are arranged so that either may complete the electrical circuit of relay K101. The microphone does so by means of a self-contained push-button switch, while the key acts as its own switch. The current for energizing the relay coil enters the transmitter through pin 45 of receptacle J102. It then flows through switch S101N to the relay coil and from there to the tip, marked T, on both the microphone and key receptacles. It can be seen from the diagram that the key, when closed, connects the relay through the sleeve of J105 to ground, thus completing the relay circuit. Should the press-to-talk switch on the

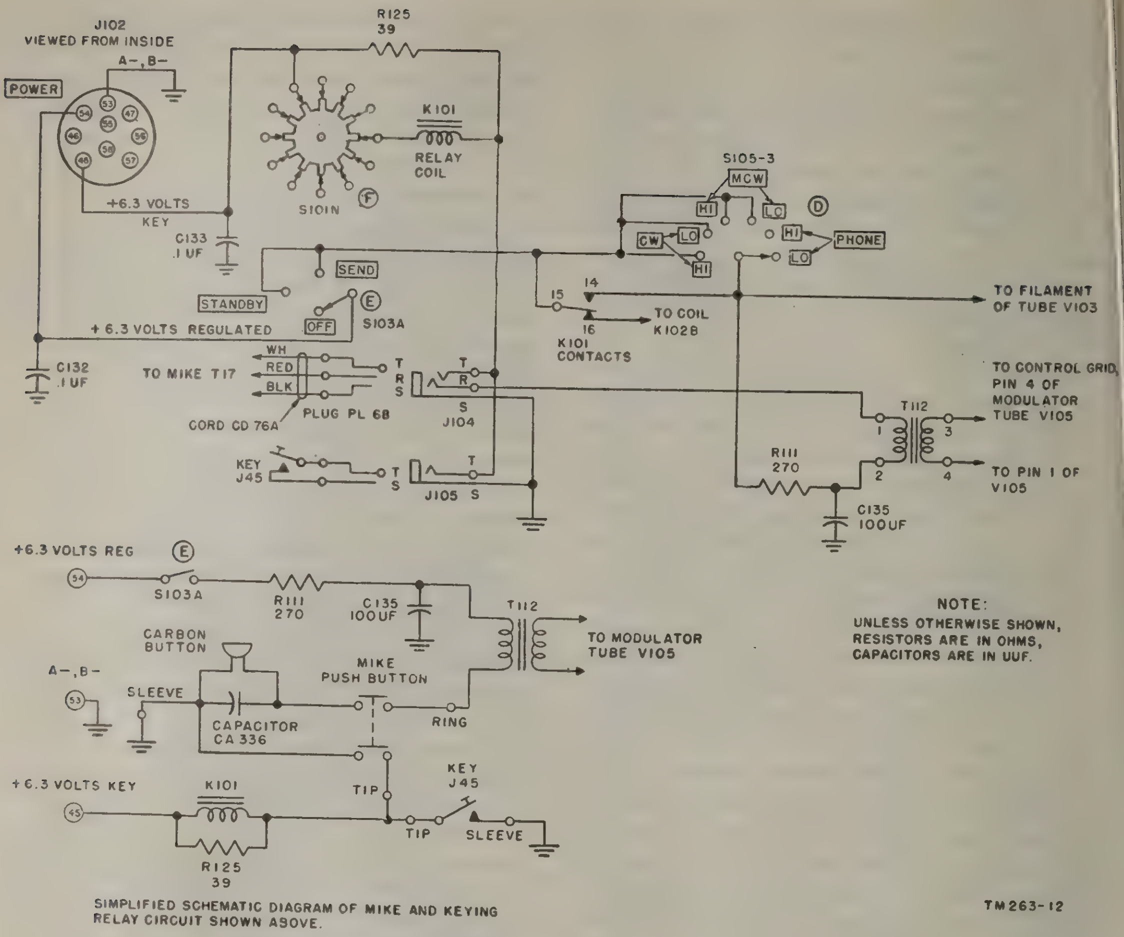

J102
VIEWED FROM INSIDE
A−, B−
POWER
53
47
46
55
56
58
54
48
57
+6.3 VOLTS
KEY
C133
.1 UF
R125
39
K101
RELAY
COIL
S101N
F
S105-3
MCW
HI
LO
D
CW
LO
HI
HI
PHONE
LO
SEND
STANDBY
E
OFF
S103A
+ 6.3 VOLTS REGULATED
15
14
16
TO COIL
K102B
K101
CONTACTS
TO FILAMENT
OF TUBE V103
C132
.1 UF
TO MIKE T17
WH
RED
BLK
PLUG PL 68
CORD CD 76A
T
R
S
T
R
S
J104
TO CONTROL GRID
PIN 4 OF
MODULATOR
TUBE V105
T112
1
3
R111
270
2
4
TO PIN 1 OF
V105
C135
100UF
KEY
J45
T
S
T
J105 S
+6.3 VOLTS REG
E
54
S103A
R111
270
C135
100UF
T112
TO MODULATOR
TUBE V105
CARBON
BUTTON
MIKE
PUSH BUTTON
A−, B−
53
SLEEVE
CAPACITOR
CA 336
RING
KEY
J45
+ 6.3 VOLTS KEY
45
K101
TIP
TIP
SLEEVE
R125
39
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
SIMPLIFIED SCHEMATIC DIAGRAM OF MIKE AND KEYING
RELAY CIRCUIT SHOWN ABOVE.
TM263-12

Figure 79. Microphone and key connections.

microphone be depressed instead of the key the relay circuit would be closed through the internal switch of the microphone. The relay current flows through the tip on J104 to the white lead in microphone Cord CD–76–A, through the switch to the black lead connected to the sleeve on Plug PL-68. The sleeve on Plug PL-68 fits into the sleeve on J104, which is directly connected to ground.

b. In order for the microphone to perform its function, there must be a d-c current flowing in its circuit. The current enters the transmitter from pin 54 of receptacle J102 and flows through the SEND position of switch S103A to the contacts of relay K101, and switch S105–3. If S105–3 is in the CW or MCW position, the current will reach the microphone regardless of the position of the relay contacts (fig. 79). However, if S105–3 is in PHONE position, the only way that the microphone can be energized is if relay contacts 15 and 14 are closed. From the pole arm of S105A, the current goes through current limiting resistor R111 to the primary of T112, and from there to ring on jack J104. The connection within the microphone itself is from ring on Plug PL–68, through the red lead to the switch contacts and to the microphone carbon button. From the button the current flows to the black lead connected to the sleeve of Plug PL–68, which fits into the sleeve of jack J104 and from there to ground. Capacitor CA–336 (inside the microphone (fig. 20)) is a filter to bypass any disturbances set up between the carbon granules. Capacitor C135 is a filter capacitor which is used to lessen microphone hiss.

c. Capacitors C132 and C133 are bypasses to keep interference from the power supply.

d. Because of the high inductance of the relay coil, there is an appreciable time lag before the current through it can build up or die down, which is undesirable for rapid keying. Therefore, resistor R125 is placed across the coil so that the current through the coil can follow the key variations more closely because of the dampening of the inductance effect by R125.

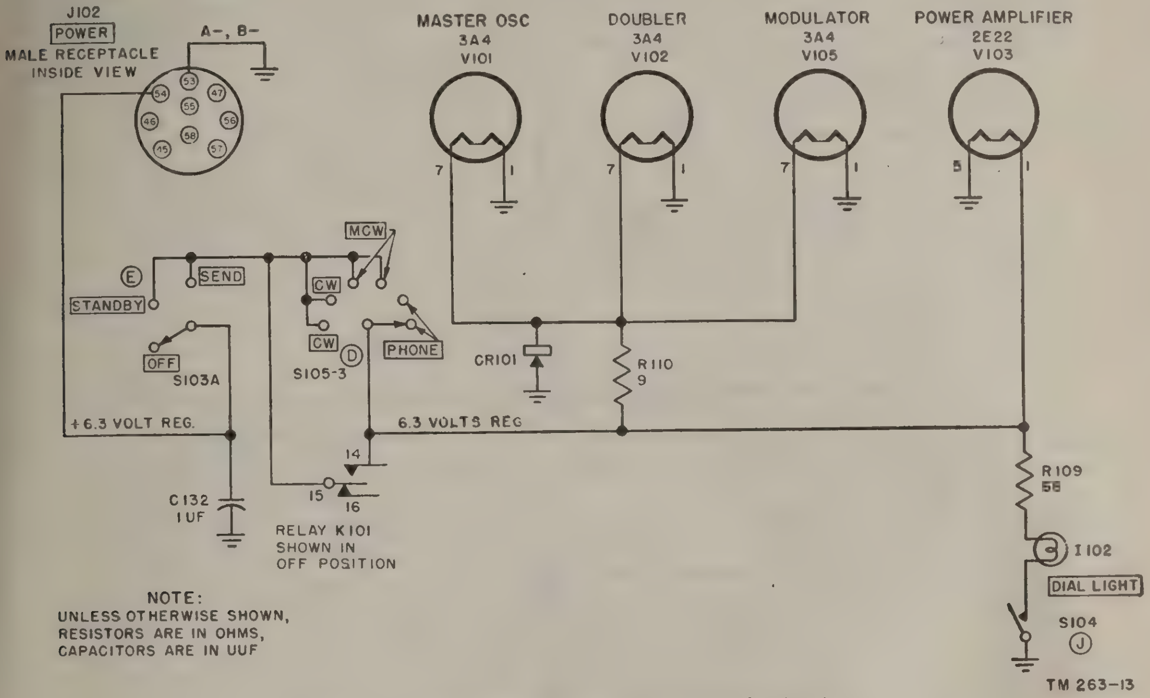

J102
POWER
MALE RECEPTACLE
INSIDE VIEW
A–, B–
53
47
54
55
46
56
58
45
57
MASTER OSC
3A4
V101
DOUBLER
3A4
V102
MODULATOR
3A4
V105
POWER AMPLIFIER
2E22
V103
7
1
7
1
7
1
5
1
MCW
E
SEND
STANDBY
CW
CW
D
PHONE
OFF
S103A
S105-3
CR101
R110
9
+6.3 VOLT REG.
6.3 VOLTS REG
14
15
16
C132
1 UF
RELAY K101
SHOWN IN
OFF POSITION
R109
56
I 102
DIAL LIGHT
S104
J
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TM 263-13

Figure 80. Transmitter filament voltage supply circuits.

100. Transmitter Filament Supply Connections

(fig. 80)

a. The transmitter filaments receive their voltage from pin 54 of receptacle J102. The regulated 6.3-volt supply is fed to switch S103A, control Ⓔ, and from there to S105–3, control Ⓓ, and also to contact 15 of keying relay K101. In the PHONE position of control Ⓓ, the tubes can receive filament voltage only if contacts 15 and 14 of K101 close; which they do only when the key or microphone button is depressed. In the mcw and c-w positions of control Ⓓ, the filaments receive voltage regardless of the position of the relay contacts.

b. Capacitor C132 is an r-f bypass capacitor to keep r-f out of the power supply. R110 and R109 are voltage-dropping resistors.

c. A small dial light, Indicator I–102, is located in the transmitter and may be turned on by means of push-button switch S104, control Ⓙ, which normally is held open by a spring.

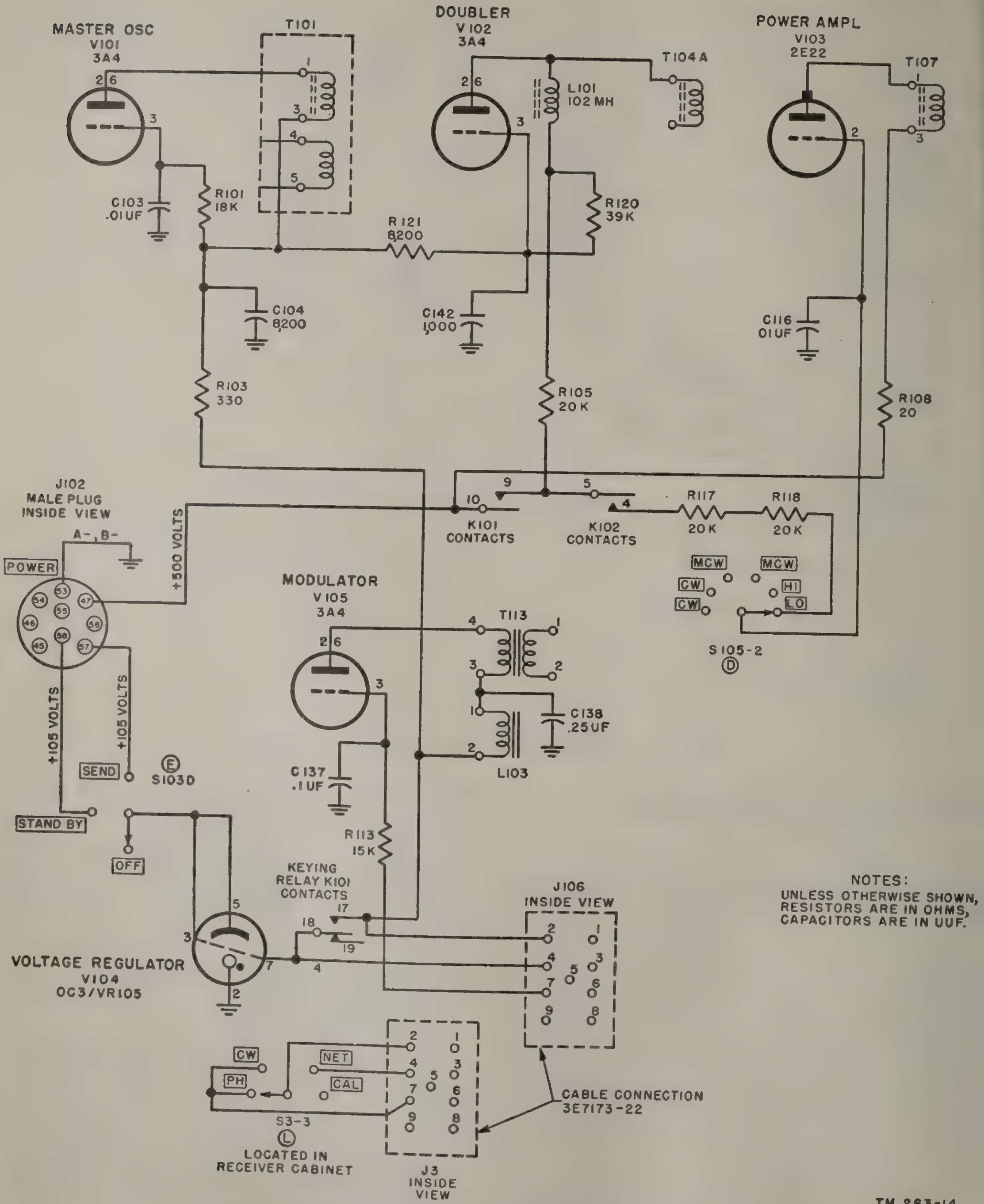
d. CR101 is a selenium voltage regulator used to keep the filament voltage on tubes V101, V102, and V105 constant at 3.6 volts.

101. Transmitter Plate and Screen Supply Circuits

(fig. 81)

a. GENERAL. The transmitter plate and screen voltages may be obtained from either the hand-operated generator or the vibrator power supply, depending on whether Cord CD–1086 is connected to the generator or the vibrator. Voltage from these two sources enters the transmitter through plug J102.

b. POWER AMPLIFIER PLATE. Terminal 47 supplies 500 volts d-c plate voltage for power


MASTER OSC
V101
3A4
T101
DOUBLER
V102
3A4
T104A
POWER AMPL
V103
2E22
T107
L101
102 MH
C103
.01 UF
R101
18K
R121
8200
R120
39K
C104
8200
C142
1,000
C116
.01 UF
R103
330
R105
20 K
R108
20
J102
MALE PLUG
INSIDE VIEW
A-, B-
POWER
+500 VOLTS
K101
CONTACTS
K102
CONTACTS
R117
20 K
R118
20 K
MCW
CW
CW
MCW
HI
LO
S105-2
Ⓓ
MODULATOR
V105
3A4
T113
C138
.25 UF
L103
C137
.1 UF
R113
15K
+105 VOLTS
+105 VOLTS
SEND
Ⓔ
S103D
STAND BY
OFF
KEYING
RELAY K101
CONTACTS
J106
INSIDE VIEW
VOLTAGE REGULATOR
V104
OC3/VR105
CW
NET
PH
CAL
S3-3
Ⓛ
LOCATED IN
RECEIVER CABINET
J3
INSIDE
VIEW
CABLE CONNECTION
3E7173-22
NOTES:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

TM 263-14

Figure 81. Transmitter plate and screen grid voltage supply circuits.

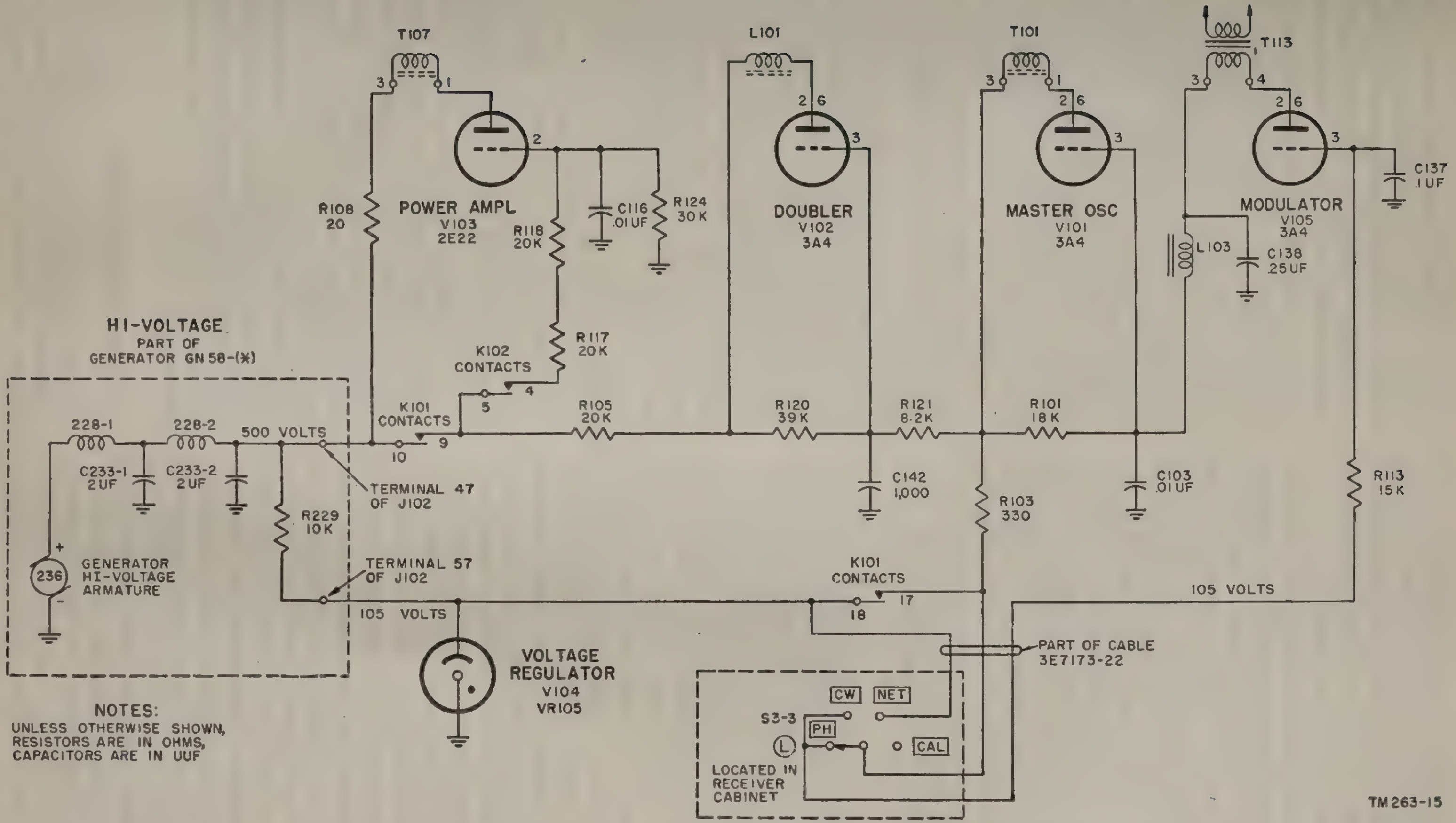

T107
L101
T101
T113
POWER AMPL
V103
2E22
DOUBLER
V102
3A4
MASTER OSC
V101
3A4
MODULATOR
V105
3A4
C137
.1 UF
R108
20
R118
20K
C116
.01 UF
R124
30K
L103
C138
.25 UF
HI-VOLTAGE
PART OF
GENERATOR GN 58-(*)
K102
CONTACTS
R117
20K
K101
CONTACTS
R105
20K
R120
39K
R121
8.2K
R101
18K
228-1
228-2
500 VOLTS
C233-1
2 UF
C233-2
2 UF
TERMINAL 47
OF J102
C142
1,000
C103
.01 UF
R113
15K
R229
10K
R103
330
236
GENERATOR
HI-VOLTAGE
ARMATURE
TERMINAL 57
OF J102
K101
CONTACTS
105 VOLTS
105 VOLTS
PART OF CABLE
3E7173-22
VOLTAGE
REGULATOR
V104
VR105
CW
NET
S3-3
PH
CAL
L
LOCATED IN
RECEIVER
CABINET
NOTES:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF
TM 263-15

Figure 82. Transmitter plate and screen grid voltage supply circuits, simplified schematic.

amplifier tube V103. The plate of V103 is connected by T107 and R108 to pin 47 of J102 (fig. 81). Thus, the moment the generator is cranked, or the vibrator is switched on, the power amplifier plate is energized.

c. Generator Power Supply. The 105-volt output of the generator enters the transmitter through terminal 57 of J102 and is fed to the SEND tap on switch S103D, control Ⓔ. When control Ⓔ is placed on SEND, the voltage is fed to pins 3 and 5 of V104 (voltage regulator tube) and reaches the contacts of keying relay K101, through the internal connection between pins 3 and 7 of V104. When contacts 17 and 18 and contacts 9 and 10 of relay K101 are open, none of the plates or screens of the tubes receive voltage, except the plate of V103 (fig. 82). If the key or press-to-talk switch on the microphone is depressed, these contacts close; all tubes receive voltage and the transmitter is in operation.

d. Overload Relay. Contacts 5 and 4 of overload relay K102 are in series with the dropping resistors to the screen grid of the power amplifier tube V103 (fig. 82). These contacts normally are closed. Should the signal voltage on the control grid of V103 fail, the tube would no longer be negatively biased, and a very large plate current would result, which could ruin the tube. In order to avoid this possibility, a relay coil is placed in series with the signal grid and the contacts of the coil are placed in series with the screen grid. These are contacts 5 and 4. Therefore, if the signal fails, no current is drawn and the relay coil is deenergized; the contacts open, thus removing screen grid voltage from V103 and reducing the plate current to almost zero.

e. Net Operation (par. 56). In order to tune the transmitter to the frequency of the net, it is necessary first to tune the receiver to the the net frequency and then to tune the transmitter oscillator tuning dial to zero-beat with the incoming net signal in the receiver. If the full power of the transmitter is used, it will drown out the net signal making it impossible to zero-beat. Therefore, the key or microphone button should not be depressed during the tuning of the transmitter for *net* operation. However, if the key or microphone button is not depressed, relay K101 contacts 17 and 18 will not be closed and the transmitter tubes will not receive plate and screen voltages. T overcome this, only oscillator tube V101 and doubler tube V102 are fed with enough operating plate and screen grid voltages. This is accomplished with switch S3–3, control Ⓛ, which is located in the receiver cabinet and is connected to the transmitter by cable 3E7173–22. When switch S3–3 is turned to NET, it shorts out contacts 17 and 18 of relay K101 (fig. 82). This allows the combined plate and screen grid currents of the doubler and oscillator tubes to flow through resistor R103 and switch S3–3 to terminal 57 of receptacle J102, and from there, by Cord CD–1086, to the generator. Switch S3–3 also disconnects the screen grid of the modulator tube V105 from the voltage source so that the tube is inoperative. This prevents sidetone from interfering with the zero beating in preparation for *net* operation.

f. Vibrator Power Unit PE–237. In order for the transmitter to receive power from the vibrator unit, Cord CD–1086 is plugged from J106 on the transmitter to plug 734 on the vibrator (fig. 64). When the set is used for long periods of listening only, a low voltage or stand-by portion of the vibrator unit is in operation. The l-v power supply requires much less vehicular battery current than does the h-v supply. This portion operates when switch S103D, control Ⓔ, is at STANDBY (fig. 81). A heavy duty portion of the vibrator supplies all power necessary for operation of the receiver and transmitter of the set. It operates when control Ⓔ is at the SEND position.

g. Voltage Regulator Tube V104. Tube V104 is a gas-filled diode which draws just enough current through it so that the voltage drop across resistor 229 in the generator or resistors 721–1 and 721–2 in the vibrator will just compensate for any rise or fall of voltage in the power supply. Thus, the plate and screen voltages of the master oscillator and modulator tubes are regulated, as are the plate and screen voltages to the receiving tubes, during receiver operation.

102. Keying Relay K101

Keying relay K101 is actuated by either the telegraph key or by the microphone press-to-talk switch. When neither of these devices is depressed, the receiver is in operation, while for transmitter operation, the key or microphone switch must be closed. When the key or microphone switch is closed, the following functions are performed by keying relay K101:

a. The antenna circuit is switched from the receiver to the transmitter.

(1) Contacts 1 and 2 open, disconnecting the ground from switch S102A.
(2) Contacts 3 and 4 close, connecting terminal A102A to switch S102A.
(3) Contacts 6 and 7 close, connecting the receiver antenna-matching transformer T114 to ground.
(4) Contacts 11 and 12 close, connecting the doublet lead to transmitter coil T110A.

b. Plate voltages are removed from all receiver tubes except V5 and V6. Screen voltages are removed from all receiver tubes. Contacts 18 and 19 open, disconnecting terminal 3 on receptacle J106 from the power feed line. Plate voltages are not removed from tubes V5 and V6 because of the higher currents they carry which, if allowed to flow through the contacts of the relay, would pit and burn them upon the opening of the contacts.

c. Plate and screen voltages are applied to the master oscillator and doubler stages. Contacts 17 and 18 close, connecting the plates and screens to the power line through pin 7 of voltage regulator tube V104.

d. Screen voltage is applied to power amplifier tube V103. Contacts 9 and 10 close, connecting the screen voltage-dropping resistors R117 and R118 to terminal 47 of power receptacle J102.

e. When switch S105–3, control Ⓓ, is in the PHONE position only, the filaments of the transmitter tubes are off, unless the key or press-to-talk switch on the microphone is depressed. Contacts 14 and 15 close, connecting resistor R110 and filament pin 1 of tube V103 to terminal 54 of receptacle J102, through switch S103A.

f. Direct current is fed to the microphone circuit. Contacts 14 and 15 close, connecting resistor R111 to the 6.3-volt supply entering terminal 54 of receptacle J102.

g. Coil K102B, which is part of overload relay K102, is constantly energized during *receiver* operation. For *transmitter* operation the voltage across the coil is removed. Contacts 15 and 16 open, disconnecting K102B from the 6.3-volt supply entering terminal 54 of receptacle J102.

Section III. THEORY OF THE GENERATOR

103. General

Generator GN–58–(*) is a hand-driven machine with its armature rotated through a step-up gear train from cranks. The output of the generator consists of two independent voltages which are regulated by a voltage regulator. Both voltages are filtered to eliminate commutator ripple and r-f interference. Generator GN–58–(*) is a two-pole machine which has two wound field coils, 237–1 and 237–2. The armature consists of two independent windings; a 6-volt winding connected to a 1-v commutator and a 425-volt winding connected to a h-v commutator.

104. H-v Circuit

(fig. 137)

a. In a d-c generator, the output is not a pure constant direct voltage because the magnetic field set up by the field poles is not uniform. The magnitude of the voltage induced in the armature coils depends on the speed of rotation of the armature and the strength of the magnetic field. Since the magnetic field is not of the same strength at all points around the armature, the voltage output of the armature will have a ripple in it instead of a smooth constant value. This is called commutator ripple. In order to smooth out this ripple, a filter circuit is incorporated in the generator housing. This filter consists of choke coils 228–1 and 228–2 and capacitors 233–1 and 233–2. The filter also serves another purpose. The sparks under the brushes, which rest on the commutator, cause r-f interference. The filter removes this interference from the power leads by bypassing the r-f to ground through the capacitors.

b. Because power amplifier tube V103 requires about 500 volts on the plate, while the other tubes require only about 105 volts, part of the h-v output of the generator is dropped down to 105 volts by means of resistor 229. The actual current through resistor 229 required to cause the voltage drop is drawn not only by the tubes, but by voltage regulator tube V104. This tube *always* takes just enough current through it to make the voltage drop across resistor 229 of the correct value which, when subtracted from the generator voltage, will leave exactly 105 volts. This 105 volts is connected to terminal 21 on terminal board 239. If the voltage at the terminal board end of resistor 229 is measured without the voltage regulator tube in its socket, the reading will be the full commutator voltage because no current will pass through resistor 229 to cause a voltage drop across it.

105. L-v Circuit
(fig. 137)

a. The l-v winding on the armature supplies power to heat the filaments of the radio tubes, to energize the keying relay, and to operate the microphone circuit. The l-v winding also supplies power to operate the voltage regulator 224. The voltage regulator acts to keep the output of the generator at a constant voltage.

b. The l-v output of the generator is filtered by choke coils 227, 226, and 225 and capacitors 231 and 230. The iron core choke coils 227 and 225 are not adequate for r-f suppression, since at the very high frequencies created by an arc, an iron-core coil may actually act as a capacitor because of the high distributed capacity of such a coil. This distributed capacity may be high enough to allow the very high frequencies to pass on to the radio set. Therefore, the air core choke coil 226 is used since at the high frequencies its stray capacitance will be negligible because of its size, but the inductance will still be large enough to surpress the r-f disturbances.

c. Iron core choke coil 225 is, in addition, a voltage-dropping resistor that drops the voltage output of the generator to 1.4 volts for the filaments of the receiving tubes.

106. Voltage Regulating Circuit of Generator GN–58–A (Late Model)
(fig. 137)

a. Because the generator is a hand-driven device, the voltage output will depend on the speed at which the hand cranks are turned. This situation is not desirable since the radio set requires a fixed, unvariable voltage supply. Therefore, a plug-in voltage regulator unit is incorporated which operates to keep the output voltage constant, regardless of the speed of rotation or the amount of load on the generator, within 50 to 70 rpm limits.

b. The regulator performs this function by decreasing the field current when the output voltage rises and by increasing the field current when the voltage output falls. This method of regulation depends on the fact that the output voltage of the generator is proportional to the speed of rotation and the strength of the field. Thus, if the speed of rotation should be raised by too rapid turning of the hand cranks, decreasing the field current would counteract the effect of greater speed. The opposite condition also applies. If the hand cranks are turned too slowly, the voltage output of the generator goes down. The obvious means of raising the voltage is to increase the field current. The following is an explanation of Generator GN–58–A (late model) regulator (fig. 137):

c. In series with the field coils is a multitapped resistor (plaques 1 and 2), the sections of which can be shorted out by the contact fingers of voltage regulator 224 (fig. 137). The force that moves these fingers is the magnetic field created by the current flow in the regulator coil. The grounded negative lead of h-v armature 235 connects to the positive side of the l-v armature 236 through variable resistor 245, the parallel combination of the 7-ohm and N.T.C. (Negative Temperature Coefficient) resistors, the regulator coil, and pin 13. Thus, since the regulator coil is connected across the l-v armature coil, the current through the regulator coil varies with the voltage output of the l-v armature.

d. The finger contacts of the regulator are all normally closed so that when the hand cranks are being turned at the correct speed, the field coils receive the correct current to produce the magnetic field necessary for normal voltage output. If the generator is turned too rapidly the following occurs:

(1) The outputs of the l-v and h-v armature coils increase.

(2) The current through the regulator coil

increases since it is across the l-v commutator.

(3) The magnetic field of the regulator coil becomes stronger and is able to attract and open the first two or three contact fingers, depending on the strength of the field.

(4) With the contacts open, the short is removed from the first two or three resistors, marked .2, .4, etc.

(5) Since there is now added resistance in the field circuit, the field current is reduced slightly.

(6) The reduced field current lowers the generator field strength and the lowered field strength results in less output voltage from the generator. Thus, the output voltage returns to the normal operating value.

e. The number of contacts that the regulator coil opens depends on the current in the coil which in turn varies with the output voltage of the l-v winding. Therefore, the resistance which is inserted in the generator field circuit is directly dependent on the output voltage. Controlling the generator field in this manner regulates the output of both the h-v and l-v armature coils since both rotate in the same magnetic field.

f. The regulating unit comes into operation only when the hand cranks are rotated above 50 rpm. If the cranks are turned too slowly, the only possible result is the decrease of voltage output from the generator. This can be remedied by a more rapid turning.

g. If the regulator itself becomes defective, do not attempt to adjust it. Remove it and plug in a new regulator unit. Some slight voltage adjustment can be made by varying the slider position on resistor 245. If the tap is moved to increase the resistance of resistor 245, there will be less current in the regulator coil and it will not have a strong enough field to keep as many contacts open, as were open before resistor 245 was manipulated. Some of the contacts will then close, allowing more current to flow in the generator field circuit, causing a higher output voltage from the generator. The tap on resistor 245 should be adjusted so that when the transmitter key is depressed, presenting full load to the generator, the voltage to ground from pin 20 on output receptacle 240 will be 6.3 volts.

h. An N.T.C. resistor is incorporated in the regulator coil circuit. If the temperature of the regulator coil should increase, the resistance of the windings increases, with a resultant decrease in current through the coil. Obviously, this will affect the output of the generator and this is undesirable. Therefore an N.T.C. resistor is placed in series with the coil circuit and the characteristics of this device are such that its resistance decreases when the temperature goes up. Thus, since its resistance is lowered, it will allow more current to flow, thereby compensating for the higher resistance of the regulator coil when the temperature increases.

107. Circuit Differences between Generators GN–58 and GN–58–A (Early Models) and GN–58–A (Late Model)

a. FILTER UNITS. The filter units of both the h-v and l-v generator armatures are exactly the same in all models except for the changes listed below:

Ref No.	Description		
	Generator GN–58	Generator GN–58–A (early)	Generator GN–58–A (late)
225	22 mh	28 mh	28 mh.
226	11 uh	11 uh	12 uh.
227	4 mh	4 mh	3.11 mh or 3.45 mh on some models.

b. VOLTAGE REGULATOR UNITS. The voltage regulator units are the same in principle but differ in construction for the different models.

c. VOLTAGE REGULATOR OF GENERATOR GN–58 (fig. 135). If the lead from the negative terminal of the l-v armature is traced through the field coils, it will be seen to pass through resistor 238 and from there directly to the positive brush of the l-v armature. Also, the regulator coil is connected across the l-v armature through resistor 242 and N.T.C. resistor 232. Therefore, the magnetic field of the regulator coil is directly dependent on the voltage output of the l-v winding. This magnetic field acts upon the vibrating contact arm so that it touches either contact A or B. For normal voltage output of the generator, the vibrator arm rests against contact A, and thus shorts out resistor 238. With resistor 238 shorted out, the generator field receives normal current.

(1) If the hand cranks are rotated too rapidly faster than 50 rpm, the following occurs:

(*a*) The voltage outputs of the generator armature coils are raised.

(*b*) The field strength of the regulator coil increases since it is connected across the l-v armature.

(*c*) The vibrating arm is then pulled away from contact A, thus connecting resistor 238 in series with the generator field.

(*d*) The generator field strength drops and the voltage output of the generator is then lowered.

(2) It is possible that the hand cranks can be turned so rapidly that damage can be done to the generator armature because of the high voltage induced. To avoid this possibility, contact B which is permanently connected to ground is incorporated as part of the regulator unit. When the hand crank is rotated with excessive speed, the following occurs:

(*a*) The regulator coil develops a very strong magnetic field because of the high generator armature voltage across it.

(*b*) The field is strong enough to pull the vibrating contact over so that it touches contact B.

(*c*) Since contact B is permanently connected to ground, the field coil of the generator, which is connected to the vibrating contact, is grounded and is no longer energized.

(*d*) Because the generator field is no longer energized, the voltage induced in the generator armature drops immediately from the harmful high value to practically zero.

(3) The regulator for Generator GN–58 is a vibrating reed, rather than a plug-in type, as in Generator GN–58–A (early and late models), and is built up on a bracket screwed to the generator structure.

d. VOLTAGE REGULATOR OF GENERATOR GN–58–A (EARLY MODELS) (fig. 136).

(1) On these models, the regulator unit is contained in a small box having an octal base similar to that of a radio tube. This base plugs into an octal socket which is located within the generator housing. Figure 136 shows that in series with the field coils there is a multitapped resistor which is connected between pins 2 and 7 of the octal base. Located above the taps is a series of flexible contacts which are all electrically connected together and rest on the taps of the multitapped resistor, one flexible contact for each tap. Therefore, when the generator is being turned at below 50 rpm, the multitapped resistor is completely shorted out by the flexible contact fingers. The regulator coil actuates these flexible contacts. If the positive lead of the l-v commutator is traced, it will be found to go through adjustable resistor 245, through the parallel combination of the N.T.C. and 9.5-ohm resistors, and then through the regulator coil to pin 1 and ground. The coil is thus placed across the l-v commutator and its magnetic strength is dependent on the l-v output of the generator.

(2) If the l-v output is too high, the magnetic strength of the coil will be great enough to partially pull up the bar to which the flexible fingers are fastened. The fingers on the ends of the multitapped resistor are raised away from the taps, removing the short across these sections and placing resistance into the generator field circuit. This cuts down the field current, thereby reducing the voltage output of the generator. Should the hand cranks be turned more rapidly, more flexible contact fingers would be raised, progressing from the ends to the center of the resistor with each increase in generator speed, thus placing more resistance in series with the generator field.

e. N.T.C. RESISTOR. The N.T.C. resistor serves the same purpose as in the other regulator models. Adjustable resistor 245 may be varied for minor adjustments of the output voltage of the generator. Another adjustment is provided. A spring is attached to the mechanism which moves the flexible fingers, and the tension in this spring will determine how many contacts will be raised for a given current through the regulator coil. This spring is not to be adjusted unless the proper equipment is used, and then only when absolutely necessary. In no case is it a field adjustment.

f. REGULATOR ADAPTER. If the regulator described above becomes defective, it is to be replaced with a regulator of the latest model. This is made possible by means of an adapter plug. This plug has an octal socket on one side (fig. 83), and a 14-pin socket on the other side. Incorporated within the body of this adapter are the multitapped wire-wound resistor and the resistor which shunts the N.T.C. resistor.

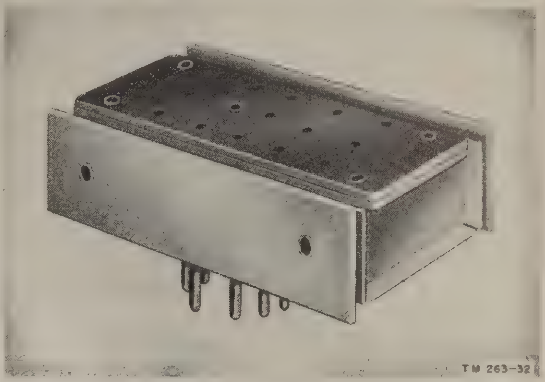


Figure 83. Voltage regulator adapter for generator GN–58–A (early models).

Section IV. THEORY OF VIBRATOR POWER UNIT PE–237

108. General

This unit is designed to convert a 6-, 12-, or 24-volt d-c input from a vehicular storage battery into the necessary operating voltages for the receiver and transmitter. It consists of two major circuits; the heavy duty (send) and the low-power (stand-by) sections. The heavy duty part is used when both the receiver and transmitter are in use and is turned on when the OFF-SEND-STANDBY switch (control Ⓔ) is turned to SEND. The stand-by section is switched on when control Ⓔ is turned to STANDBY. This operation automatically switches off the heavy duty section. In stand-by operation, only the receiver is supplied with power, and this presents less of a drain on the battery than when the heavy duty section is used. This is advantageous for prolonged periods of listening.

109. Circuit Breaker

The vehicular battery is connected to the + and – terminals across capacitor 706. Before the current from the vehicular battery passes to either portion of the power supply, it must first pass through circuit breaker 728 (fig. 141). Circuit breaker 728 protects both the battery and Vibrator Power Unit PE–237 from any overload, since it opens the circuit if too much current flows through its magnetic coil. Circuit breaker 728 is also the main ON-OFF switch for the vibrator power supply (fig. 15). When the OFF button is pressed, the contacts are held open by a spring-loaded mechanism, and in order to turn the power supply on, the tension of the spring must be overcome by pressing the ON button. When the current drain on the battery becomes too great, the circuit breaker coil releases a small catch which then allows the spring to open the contacts, thus stopping the high current flow.

110. Voltage Selector Switches

In Vibrator Power Unit PE–237, all triple-pole, triple-contact wafer switches are voltage selector switches. They are all ganged to one common shaft and perform the function of connecting the correct operating voltages to the different circuit components when a 6-, 12-, or 24-volt vehicular battery is used. The switches are numbered 735–1 to 735–8. Each wafer section is in itself divided into three separate sections (fig. 141).

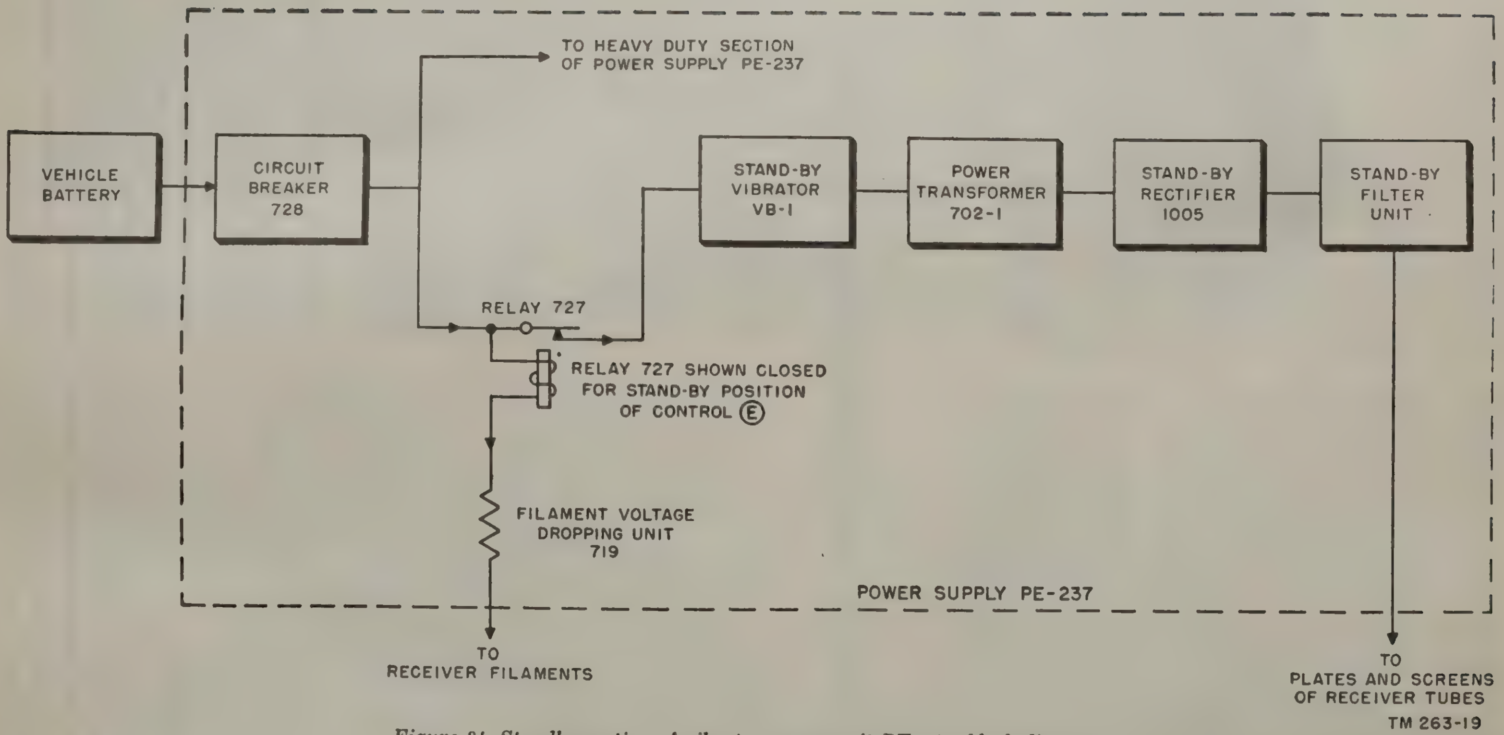

TO HEAVY DUTY SECTION
OF POWER SUPPLY PE-237
VEHICLE BATTERY
CIRCUIT BREAKER 728
STAND-BY VIBRATOR VB-1
POWER TRANSFORMER 702-1
STAND-BY RECTIFIER 1005
STAND-BY FILTER UNIT
RELAY 727
RELAY 727 SHOWN CLOSED
FOR STAND-BY POSITION
OF CONTROL Ⓔ
FILAMENT VOLTAGE
DROPPING UNIT
719
POWER SUPPLY PE-237
TO
RECEIVER FILAMENTS
TO
PLATES AND SCREENS
OF RECEIVER TUBES
TM 263-19

Figure 84. Standby section of vibrator power unit PE-237, block diagram.

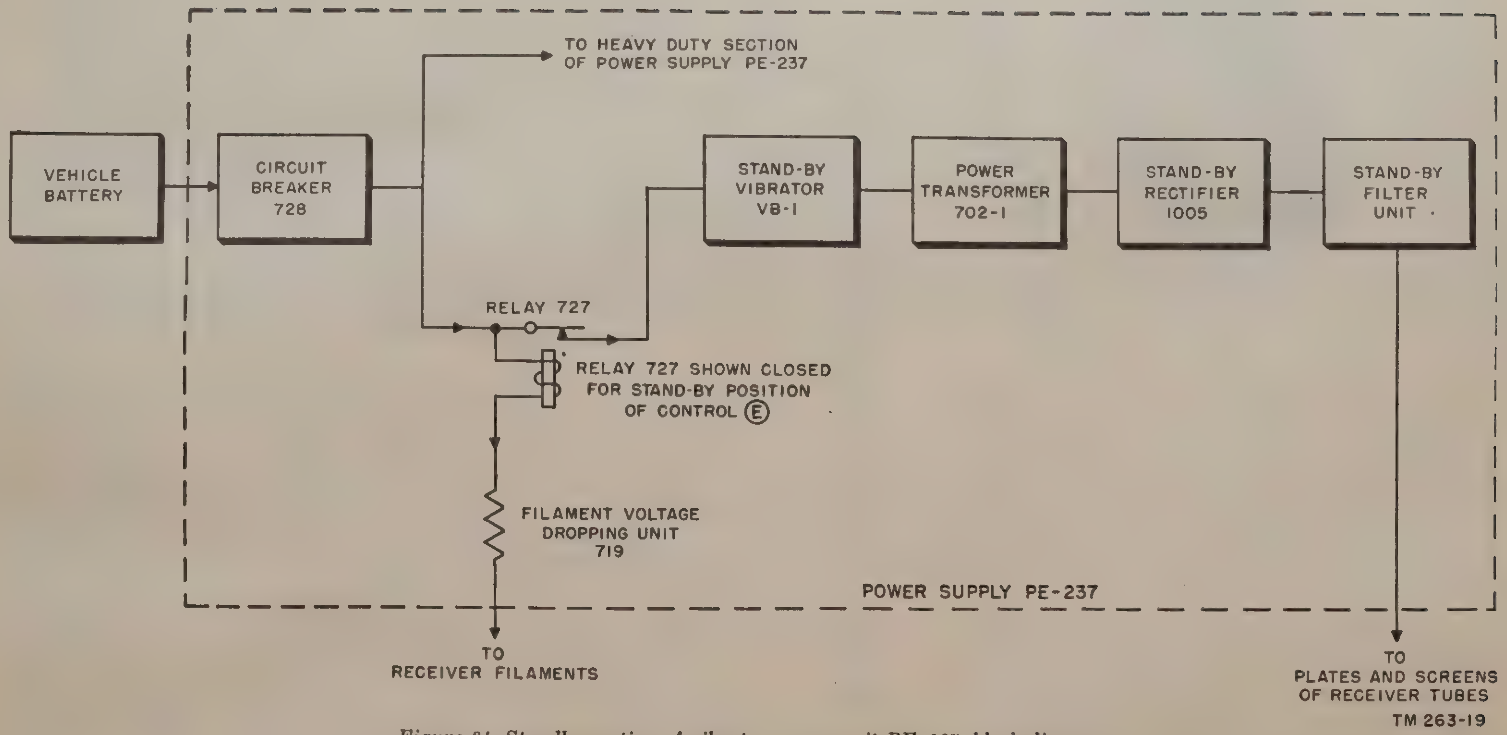
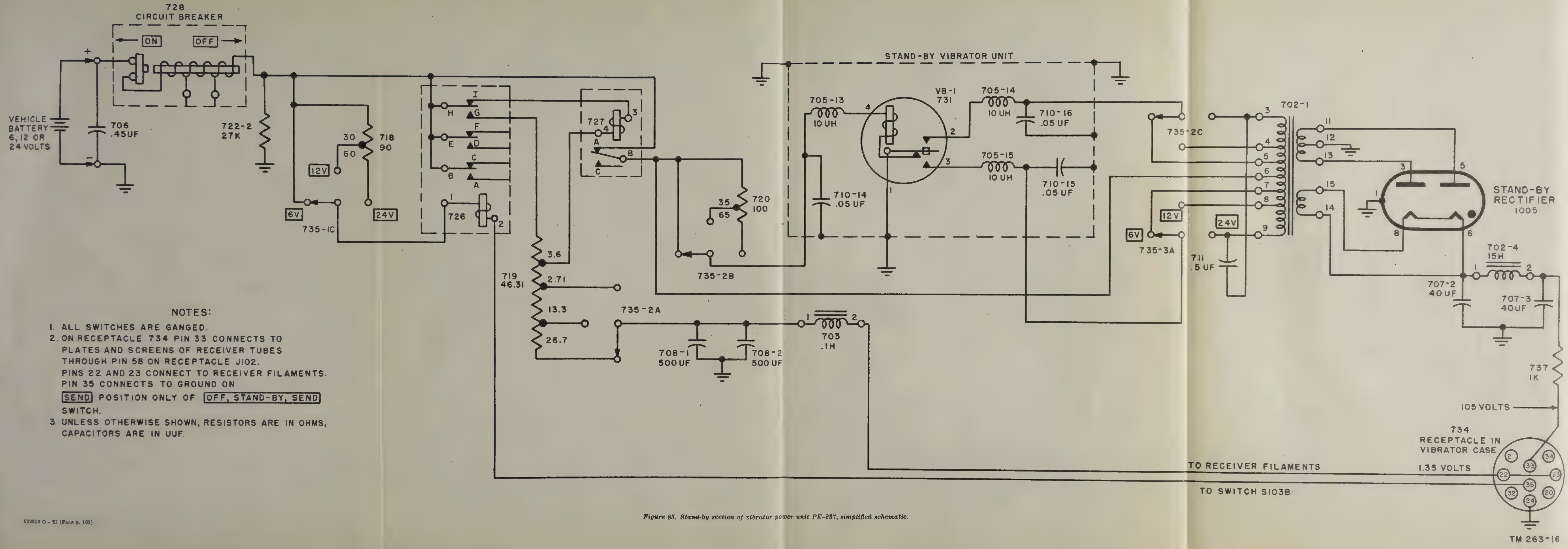

VEHICLE BATTERY
CIRCUIT BREAKER 728
TO HEAVY DUTY SECTION OF POWER SUPPLY PE-237
STAND-BY VIBRATOR VB-1
POWER TRANSFORMER 702-1
STAND-BY RECTIFIER 1005
STAND-BY FILTER UNIT
RELAY 727
RELAY 727 SHOWN CLOSED FOR STAND-BY POSITION OF CONTROL Ⓔ
FILAMENT VOLTAGE DROPPING UNIT 719
POWER SUPPLY PE-237
TO RECEIVER FILAMENTS
TO PLATES AND SCREENS OF RECEIVER TUBES
TM 263-19

Figure 84. Standby section of vibrator power unit PE–237, block diagram.


728
CIRCUIT BREAKER
ON
OFF
+
-
VEHICLE BATTERY 6, 12 OR 24 VOLTS
706 .45UF
722-2 27K
30
60
718 90
12V
6V
24V
735-IC
I
H
G
F
E
D
C
B
A
726
1
2
727
4
3
A
B
C
3.6
2.71
719 46.31
13.3
26.7
35
65
720 100
735-2B
735-2A
708-1 500UF
708-2 500UF
703 .1H
1
2
STAND-BY VIBRATOR UNIT
705-13 10 UH
710-14 .05 UF
VB-1 731
4
2
3
1
705-14 10 UH
710-16 .05 UF
705-15 10 UH
710-15 .05 UF
735-2C
702-1
3
4
5
6
7
8
9
11
12
13
15
14
12V
6V
24V
735-3A
711 .5 UF
STAND-BY RECTIFIER 1005
1
3
5
8
6
702-4 15H
1
2
707-2 40UF
707-3 40UF
737 1K
105 VOLTS
734 RECEPTACLE IN VIBRATOR CASE
1.35 VOLTS
TO RECEIVER FILAMENTS
TO SWITCH S103B
21
34
22
33
23
35
32
24
20
TM 263-16

NOTES:

1. ALL SWITCHES ARE GANGED.
2. ON RECEPTACLE 734 PIN 33 CONNECTS TO PLATES AND SCREENS OF RECEIVER TUBES THROUGH PIN 58 ON RECEPTACLE J102.
   PINS 22 AND 23 CONNECT TO RECEIVER FILAMENTS.
   PIN 35 CONNECTS TO GROUND ON SEND POSITION ONLY OF OFF, STAND-BY, SEND SWITCH.
3. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 85. Stand-by section of vibrator power unit PE-237, simplified schematic.

111. Stand-by Section of Vibrator Power Unit PE–237

(fig. 84)

a. General. Because the stand-by section supplies power to the receiver only, it takes less current from the battery than does the heavy duty part. There is no direct switch to turn on the stand-by portion, but it is made to operate automatically when the OFF-SEND-STANDBY switch, control Ⓔ, is turned to STANDBY. The receiver filaments receive their voltage through circuit breaker 728, coil of relay 727, and voltage-dropping resistor 719 (fig. 141). Thus, when the switch is turned to STANDBY, filament current flows through the relay coil and closes the contacts. With the contacts closed, vibrator VB–1 is connected to the vehicular battery and begins operating. The vibrator causes the battery current to flow through the power transformer primary in a manner simulating an alternating current. The voltage across the secondary, which is greatly increased over that of the primary, is then rectified by the vacuum-tube rectifier and filtered for ripple by the filter unit. The high d-c voltage is then fed to the plates and screens of the receiving tubes.

b. Detailed Circuit Analysis (fig. 85.) Only the stand-by portion and relays 726 and 727 are shown in this figure. These relays determine, by the position of their contacts, whether the send or stand-by section is connected to the battery, and, in this case, the stand-by section is in operation. If current is made to flow through the coil of relay 726, the contacts would swing toward the coil and the stand-by section would cease to operate while the send vibrator would begin functioning. The numbers and letters shown on the contacts and coils of relays 726 and 727 have been assigned for ease of explanation only and do not appear on the equipment.

(1) Connection 1 of the coil of relay 726 connects to voltage selector switch 735–1C, which introduces the proper resistance in series with the relay coil to accommodate it to each of the three different battery voltages used. From the switch, the circuit continues to the coil of circuit breaker 728, through its contacts, and from there to the positive terminal of the battery. Thus, when the ON button is pressed, the terminal end of coil 726 is connected to the positive terminal of the battery. For current to flow through the coil, its number 2 terminal must be connected to the negative terminal of the battery. The number 2 lead connects to pin 35 of power output receptacle 734. Further, pin 35 connects to pin 55 of J102, the transmitter receptacle, through Cord CD–1086. It will be seen from the main schematic of the transmitter, that pin 55 can be connected to ground only if switch S103B, which is the OFF-SEND-STANDBY control Ⓔ, is turned to SEND. Therefore, unless the control is placed on SEND, the coil of relay 726 is unenergized and out of stand-by circuit.

(2) The contacts of relay 726 are shown for this unenergized condition and it is seen that contacts H and I connect lead 3 of the coil of relay 727 to the positive terminal of the battery, through the circuit breaker. The bottom side, lead 4 of the coil of relay 727, is connected to voltage-dropping resistor 719, from there to the voltage-selection switch 735-2A, through the choke coil 703 to pin 22 of Power output receptacle 734. Pin 22 connects by Cord CD--1086 to the transmitter and then to the receiver tube filaments, which lead relay 727 to ground as soon as control Ⓔ is placed on STANDBY. Thus, if switch S103C, control Ⓔ, is turned to STANDBY, the circuit of the coil of relay 726 is opened and the circuit of the coil of relay 727 is completed and the coil of relay 727 is energized. The movable contact of relay 727, shown in the correct position for this condition, connects to both the center tap of the power transformer and the voltage-selector switch 735–2B. Switch 735–2B selects the correct voltage for operation of Vibrator VB–1.

112. Standby Vibrator and Rectifier Circuits

a. Vibrator Circuits. The vibrator coil connected from pin 4 to the stationary contact and the movable arm connected to pin 1 constitute an ordinary buzzer similar to the door bell type, except that its vibrating arm or reed moves back and forth many times more rapidly than in the familiar door bell buzzer. The current through the vibrator coil attracts the reed, breaking the circuit to ground. This de-energizes the coil and the reed swings back in the opposite direction, completing the circuit to ground again. This cycle continues. The movable arm connects to ground through pin 1, and also makes contact with pins 2 and 3 in the two opposite directions of its vibration, thus connecting each pin alternately to ground (fig. 85). These pins (2 and 3) are connected to voltage selector switches 735–2C and 735–3A, which select the proper voltage for operation of the power transformer 702–1. Therefore, as the movable arm vibrates, alternately to connect the top and the bottom of the primary of transformer 702–1 to ground, center tap 6 connects through contacts A and B of relay 727 to the positive terminal of the battery. Because of this center tap, the current in the primary flows from the center to either the top or bottom half of the primary, depending on whether pin 2 or 3 of the vibrator is connected by the vibrating arm to ground. Therefore, the function of the vibrator is to cause an alternating current to flow through the transformer primary by making the battery current flow first in one direction and then in the opposite direction through the primary, simulating an alternating current. It is actually the pulse of d-c current sent through alternate halves of the primary that causes a voltage to be induced in the secondary.

b. RECTIFIER CIRCUITS. The transformer secondary consists of two windings. The l-v winding between taps 14 and 15 supplies the filament voltage for standby rectifier tube 1005. The h-v winding between taps 11 and 13 applies a very large a-c voltage to the plates of the rectifier tube for rectification. The rectified output of tube 1005 is taken from pin 6 to center tap 12 of the h-v secondary, which is grounded. The h-v output thus appears across electrolytic capacitor 707–2. Capacitor 707–2, in conjunction with choke coil 702–4 and capacitor 707–3, acts as a filter unit to suppress the ripple voltage in the output of rectifier tube 1005. The high direct voltage output of the stand-by section is then fed to terminal 33 of power output receptacle 734 through voltage-dropping resistor 737. Terminal 33 connects by Cord CD–1086 to transmitter receptacle J102, pin 58.

113. Other Stand-by Circuit Elements

a. In the explanation of the stand-by unit, several circuit elements have been omitted. This was done to clarify the essential points of operation. The functions of these elements are explained below.

b. Filter chokes 705–13, 705–14, and 705–15 are incorporated for elimination of hash from the vibrator and are used in conjunction with r-f filter capacitors 710–14, 710–15, and 710–16. Resistor 719 is the voltage-dropping unit used to accommodate the receiver filaments to the voltage of the battery used. Electrolytic filter capacitors 708–1 and 708–2 are used in conjunction with choke 703 to filter out any ripple in the battery voltage because of the intermittent current taken from the battery by Vibrator VB–1.

c. Capacitor 711 is the buffer. Its function is to improve the waveshape of the alternating voltage across the primary of power transformer 702–1. The improved waveshape minimizes vibrator arcing. Should this capacitor become defective, replace it as soon as possible with a capacitor having the same capacity rating. If the same capacity is not used, the life of the vibrator will be greatly reduced. Capacitor 706, across the power unit input, is an r-f bypass to prevent the input cables from radiating r-f noise that would interfere with radio reception.

114. Heavy Duty Section of Vibrator Power Unit PE–237

The heavy duty section of Power Unit PE–237 supplies all the necessary power required to operate both the receiver and transmitter. The filaments of the receiver receive their voltage from the vehicle battery through suitable dropping resistors. The transmitter filaments, however, do not receive their voltage directly from the battery. The voltage for the transmitter filaments is obtained from the secondary of the vibrator transformers, through a voltage regulating transformer, a rectifier, and a filter which maintain close control of the output voltage even though the input voltage var-

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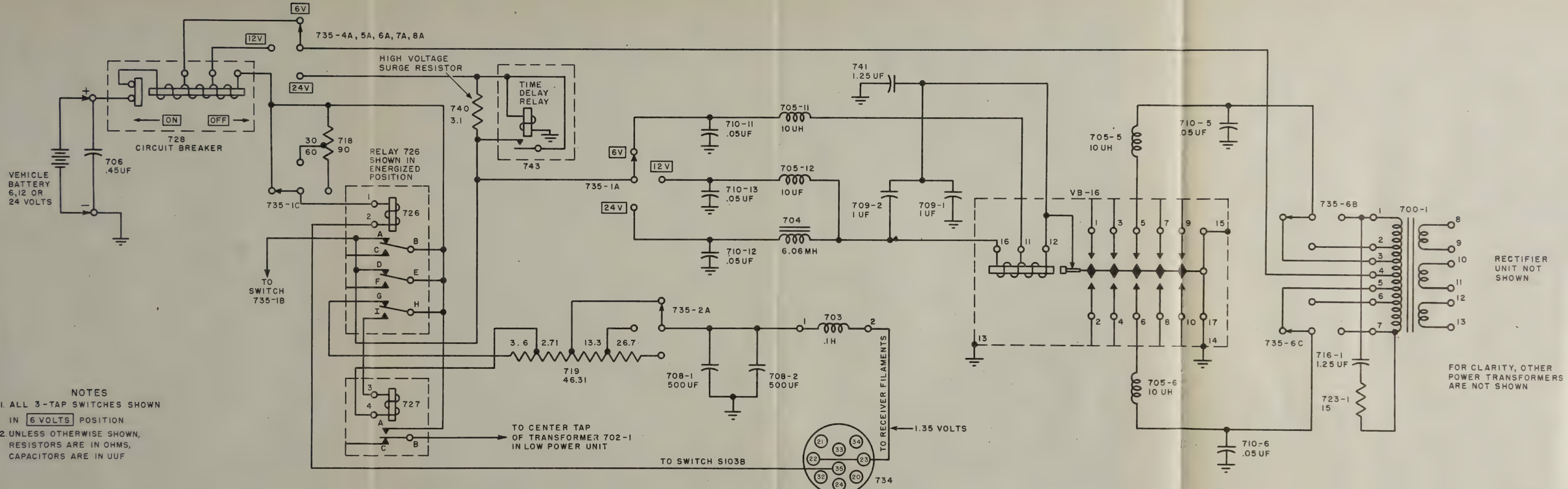

6V
735-4A, 5A, 6A, 7A, 8A
12V
24V
HIGH VOLTAGE
SURGE RESISTOR
TIME
DELAY
RELAY
743
740
3.1
ON
OFF
728
CIRCUIT BREAKER
+
−
VEHICLE
BATTERY
6,12 OR
24 VOLTS
706
.45UF
30
60
718
90
RELAY 726
SHOWN IN
ENERGIZED
POSITION
735-1C
726
A
B
C
D
E
F
G
H
I
1
2
TO
SWITCH
735-1B
735-1A
6V
12V
24V
741
1.25 UF
710-11
.05UF
705-11
10UH
710-13
.05UF
705-12
10UF
710-12
.05UF
704
6.06MH
709-2
1 UF
709-1
1 UF
VB-16
16
11
12
1
3
5
7
9
15
2
4
6
8
10
17
13
14
705-5
10 UH
710-5
.05UF
705-6
10 UH
710-6
.05 UF
735-6B
735-6C
700-1
RECTIFIER
UNIT NOT
SHOWN
716-1
1.25 UF
723-1
15
FOR CLARITY, OTHER
POWER TRANSFORMERS
ARE NOT SHOWN
735-2A
3.6
2.71
13.3
26.7
719
46.31
703
.1H
708-1
500UF
708-2
500UF
TO RECEIVER FILAMENTS
1.35 VOLTS
727
3
4
TO CENTER TAP
OF TRANSFORMER 702-1
IN LOW POWER UNIT
TO SWITCH S103B
21
33
34
22
35
23
32
24
20
734

NOTES

1. ALL 3-TAP SWITCHES SHOWN IN **6 VOLTS** POSITION
2. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF

TM 263-18

Figure 86. Heavy duty (send) section of Vibrator Power Unit PE-237, simplified schematic.

929610 O - 51 (Face p. 105)

ies over wide limits. The heavy duty section uses five small power transformers, with the primary of each connected to two separate contacts on the vibrator, in place of one single transformer, as with the stand-by section. This system is used to distribute the power carried by the vibrator contacts, lengthening vibrator life.

115. Heavy Duty Positions of Relays 726 and 727

(fig. 86)

a. Figure 86 shows the heavy duty section, up to the primary of one of the power transformers. The stand-by part is not shown, and neither is the rectifier for the heavy duty section, which will be discussed in a later paragraph. Terminal 1 of the coil of relay 726 connects through voltage selector switch 735–1C to circuit breaker 728, and to the positive terminal of the vehicular battery. If the other end of the coil of relay 726 is connected to ground, the relay would be energized. Terminal 2 of the coil of relay 726 connects to terminal 35 of power output receptacle 734. Terminal 35 connects to terminal 55 of receptacle J102 in the transmitter by means of Cord CD–1086. Pin 55 (fig. 139) connects to ground when switch S103B is turned to SEND. Therefore, when control Ⓔ is turned to SEND, the coil of relay 726 is energized and pulls the movable contacts up (fig. 86).

b. Terminal 3 of the coil of relay 727 connects to a stationary contact I of relay 726 and, because of the position of the movable arm of relay 726, the coil of relay 727 receives no current from the battery. Therefore, since relay 727 is not energized, the stand-by section of the vibrator power unit is inoperative.

116. Receiver Filament Supply

Filament-dropping resistor 719 connects directly to stationary contact G on relay 726 and through movable contact H which is connected to the positive side of the battery through circuit breaker 728. Therefore, on SEND, the receiver filaments obtain their current through contacts of relay 726, while on STANDBY, the filament current flows through the coil of the other relay 727.

117. Switches 735–4A, –5A, –6A, –7A, and –8A

(fig. 86)

The center tap 4 of power transformer 700–1 is connected to switch 735–4A, –5A, –6A, –7A, –8A. This portion of switch 735 is a ganged bank of five wafer switches whose corresponding contacts are wired in parallel so that the heavy current taken by the power transformers can be handled safely. The purpose of the switch is to accommodate the transformer to a 6-, 12-, or 24-volt battery. For the 24-volt position, a slightly different arrangement is necessary than for 6 or 12 volts (par. 118).

118. H-v Starting Resistor

In the later models of Vibrator Power Unit PE–237 (serial Nos. 22436 through 26799), an h-v starting resistor and a time delay relay are incorporated. Resistor 740 is the h-v surge resistor. It is connected in the input circuit of the vibrator supply only when the unit is operated with the voltage change switch in the 24-volt position. It serves to prevent flare-up at the power contacts of Vibrator VB–16. The possibility of flare-up is due to the initial surge of current when the unit is started and the supply voltage is high. Resistor 740 limits this initial surge. The time delay relay 743 shorts out resistor 740 after approximately 100 milliseconds, and the full normal voltage is applied to the set. The relay does not operate on the 12- or 6-volt position of switch 735.

Note. Vibrator VB–16 may be damaged permanently if an attempt is made to operate this unit on the 24V position with the contacts of the time delay relay shorted out.

119. Driving Coil of Vibrator VB–16

Two of the stationary contacts, A and D, of relay 726 are connected to switch 735–1A, which is the voltage selector for the driving coil of Vibrator VB–16. Because of the position of the movable contacts in the SEND position of transmitter control Ⓔ, these two stationary contacts are connected to the positive side of the vehicular battery, through the circuit breaker. Three taps numbered 16, 11, and 12 are on the driving coil of the vibrator. Tap 12 is connected to ground whenever the vibrating reed touches the stationary contact to which tap 12 is connected. Current enters the driving coil through choke coil 705–11, 705–12, or 704, depending on the position of voltage selector switch 735–1A. When switch 735–1A is on the 6V position, the battery current enters the driving coil at tap 11. On either the 12V or 24V position, battery current enters at tap 16. Choke coil 704 in the 24-volt line has a higher resistance than choke 705–12 in the 12-volt line. The voltage drop across this higher resistance compensates for the higher battery voltage.

120. Vibrator and Power Transformer

a. The center tap of power transformer 700- is connected through switch 735–4A, –5A, –6 –7A, –8A to the positive side of the batter The vibrator connects the primary leads alte nately to ground to simulate an alternating cu rent in the primary. The vibrating reed i grounded at pin 14, while the outside leads o the primary are connected to pins 5 and through switches 735–6B and 735–6C (fig. 86)

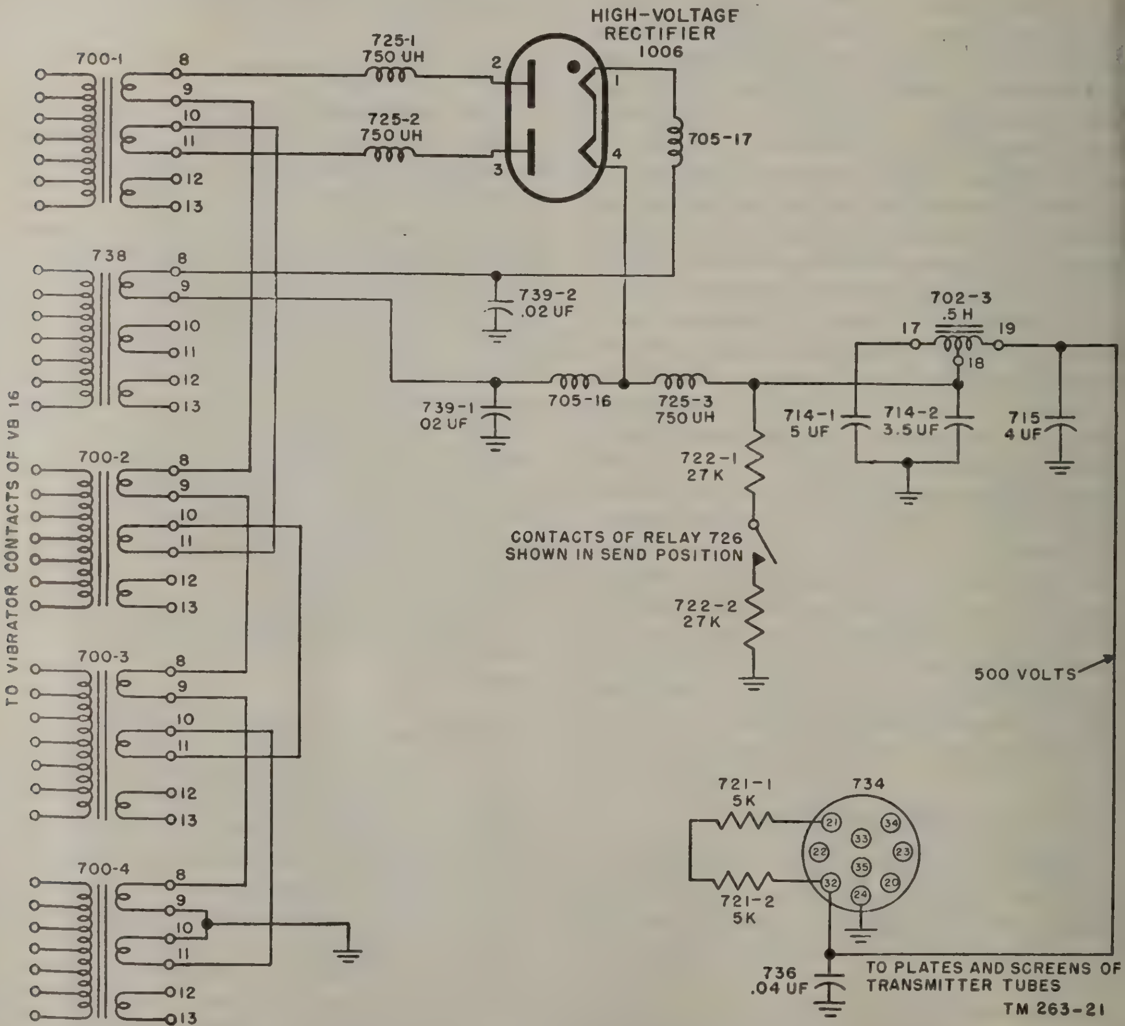

HIGH-VOLTAGE RECTIFIER 1006
725-1 750 UH
725-2 750 UH
705-17
700-1
738
700-2
700-3
700-4
8
9
10
11
12
13
1
2
3
4
739-2 .02 UF
739-1 02 UF
705-16
725-3 750 UH
702-3 .5 H
17
18
19
714-1 5 UF
714-2 3.5 UF
715 4 UF
722-1 27 K
CONTACTS OF RELAY 726 SHOWN IN SEND POSITION
722-2 27 K
TO VIBRATOR CONTACTS OF VB 16
500 VOLTS
721-1 5 K
721-2 5 K
734
21
22
23
24
32
33
34
35
20
736 .04 UF
TO PLATES AND SCREENS OF TRANSMITTER TUBES
TM 263-21

Figure 87. High-voltage rectifier and filters of heavy duty section of vibrator power unit PE–237, simplified schematic.

b. There are five pairs of contacts. Just as pins 5 and 6 connect to the primary leads through voltage selector switches, so do the other four pairs of pins connect to four other identical power transformers. There are in effect five identical transformers with their primaries connected in parallel by the vibrating reed. Refer to the vibrator main schematic (fig. 141), transformer 700–4 for example. Lead 5 of the primary goes to switch 735–4C, and from there, through choke coil 705–10 to contact 10 of Vibrator VB–16. Lead 3 of the primary goes to switch 735–4B, and from there, through choke coil 705–9 to contact 9 of the vibrator.

121. Other Heavy Duty Circuit Elements

a. In the explanation of the heavy duty unit so far, the functions of several components have not been mentioned. Some of the components are drawn only on the vibrator main schematic (fig. 141). Capacitors 710–1 through 710–13, in conjunction with chokes 704 and 705–1 through 705–12, filter out r-f interference produced by the sparking of the vibrator contacts. Capacitors 709–1, 709–2, and 741 suppress sparking at the driving coil contact of the vibrator.

b. Capacitors 716–1 through 716–5, across the primaries of the power transformers, are the buffer capacitors which improve the waveshape of the primary current, thus lengthening the life of the vibrator contacts by reducing sparking. If these capacitors become defective, replace them with others of exactly the same capacity rating; otherwise, the vibrator contacts will be subjected to severe arcing. Resistors 723–1 through 723–5, which are in series with the buffers, damp out any oscillations which might occur because of the interaction of the buffers with the leakage reactances of the power transformers.

122. Rectifier and H-v Filter

a. The a-c surges through the primaries of the power transformers cause a very high voltage to be induced in the secondaries (fig. 87). All the secondaries having taps marked 8 and 9, and all the secondaries having taps marked 10 and 11 are connected in series, except the windings of transformer 738. The combined voltage present in this series combination is impressed upon the plates of rectifier tube 1006, which operates as a full-wave rectifier, and is rectified. The filament of tube 1006 receives its voltage from taps 8 and 9 of transformer 738 and this is the only purpose for which transformer 738 is used. Because of r-f noise generated in gas tube 1006, it is necessary to place r-f choke coils 725–1 and 725–2 in series with the rectifier plates to filter out any r-f disturbances which occur. Hash suppression filters located in the filament leads, consist of capacitors 739–1 and 739–2 in conjunction with choke coils 705–16 and 705–17. The rectified h-v output of 1006 is taken from pin 4 of tube 1006, to ground.

b. The output is filtered by choke coil 702–3, in conjunction with capacitors 714–1, 714–2, and 715. There is an additional filtering feature because the h-v lead from the rectifier tube is connected to tap 18 and not tap 17 of choke coil 702–3. This is done so that the ripple current entering the choke will divide and flow from tap 18 in opposite directions through the coil, and thereby the magnetic effect of the ripple current will partly cancel itself out.

c. The filtered hv at tap 19 of choke 702–3 is connected to terminal 32 of power output receptacle 734. Capacitor 736 is an additional hash filter to prevent r-f disturbances from entering the transmitter. Resistors 721–1 and 721–2 are used to drop the voltage to the plates and screens of the receiver and transmitter tubes. Choke coil 725–3, connected to pin 4 of tube 1006 is a hash suppression filter.

d. In order to discharge filter capacitors 714–1, 714–2, and 715 when the power supply is turned off, resistors 722–1 and 722–2 are placed across them to ground. This allows the stored charge to leak off to ground (fig. 141). Resistor 722–1 connects to resistor 722–2 and ground only when relay 726 contacts, E and F are in the STANDBY position.

123. Transmitter Filament Supply (fig. 88)

a. The filaments of the transmitter tubes receive their power from power transformer windings with taps marked 12 and 13 connected in series. This combined voltage is then fed to taps 1 and 2 of a special constant-voltage step-down transformer, 701. This transformer

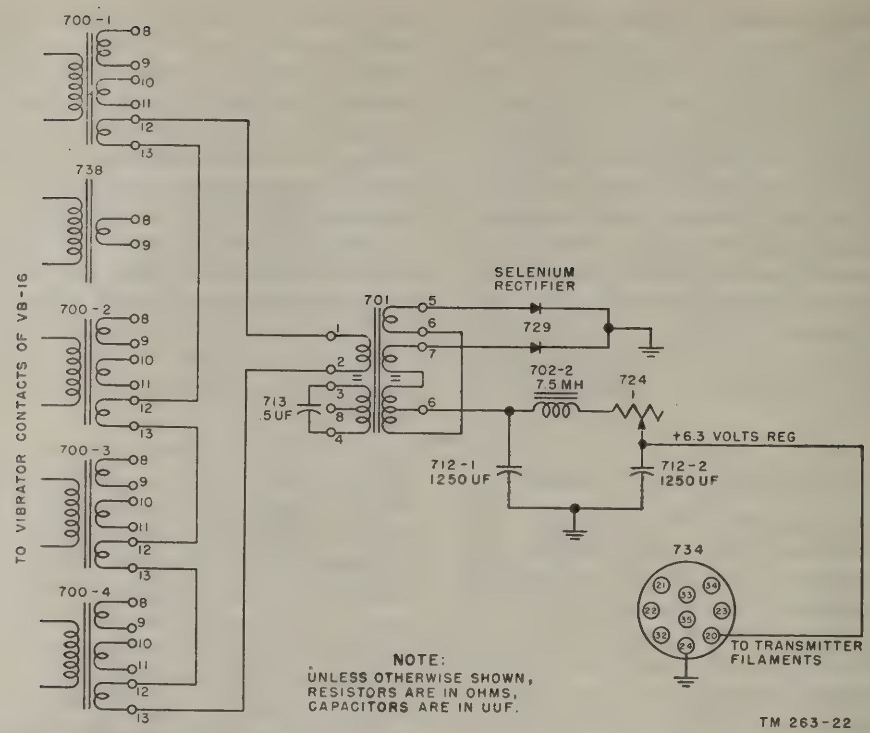

700 - 1
8
9
10
11
12
13
738
8
9
TO VIBRATOR CONTACTS OF VB-16
700 - 2
8
9
10
11
12
13
700 - 3
8
9
10
11
12
13
700 - 4
8
9
10
11
12
13
701
1
2
3
8
4
5
6
7
6
713
.5 UF
SELENIUM
RECTIFIER
729
702-2
7.5 MH
724
+6.3 VOLTS REG
712 - 1
1250 UF
712 - 2
1250 UF
734
21
33
34
22
35
23
32
24
20
TO TRANSMITTER
FILAMENTS
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
TM 263-22

Figure 88. Transmitter filament voltage supply circuit of Vibrator power unit PE–237, simplified schematic.

acts to keep the output voltage to selenium rectifier 729 constant, regardless of battery voltage changes within certain limits (fig. 89). Input voltage to the transformer is applied to the primary, coil 1.

b. In an ordinary transformer, coil 1 would induce a voltage in coil 4, the secondary. However, there is placed between coils 1 and 4 a magnetic shunt which serves to isolate, to a large extent, coil 1 from 4. Coil 2 is tuned to resonate at the major frequency of the vibrator output current, through coil 1. Therefore it has a large current flowing through it, even though it too has a magnetic shunt between it and the primary, coil 1. This large current in coil 2 induces a voltage in the secondary, coil 4. Also, since there is high current in the tuned tank, the iron core between it and coil 4 is saturated. This means that variations in magnitude of current in coil 2 do not have a great effect on the voltage induced in the secondary, coil 4.

c. Coil 3, the compensating winding, is on the same side of the magnetic shunt as coil 1 and, therefore, coil 1 induces a voltage in coil 3. Coil 3 is connected in series with coil 4 in such a manner as to buck the voltage in coil 4. Assume that the transformer is operating, and suddenly, for some reason, the voltage placed across the primary is increased. The voltage induced in coil 2 does not change too much because of the magnetic shunt. Next, the voltage induced in coil 4 by the current in coil 2, changes even less because of the saturation of the core between coil 2 and 4. Also, since coil

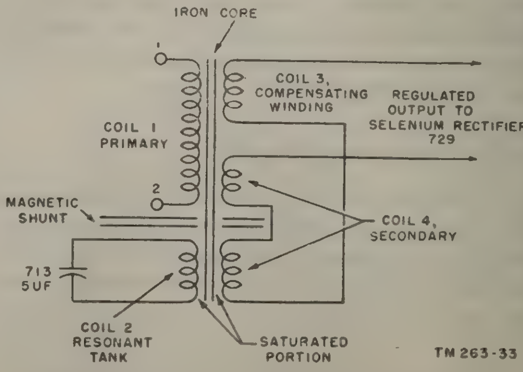

IRON CORE
1
2
COIL 1
PRIMARY
COIL 3,
COMPENSATING
WINDING
REGULATED
OUTPUT TO
SELENIUM RECTIFIER
729
MAGNETIC
SHUNT
COIL 4,
SECONDARY
713
5UF
COIL 2
RESONANT
TANK
SATURATED
PORTION
TM 263-33

Figure 89. Constant voltage transformer 701, vibrator power unit PE–237.

3 is connected to oppose the voltage of coil 4, the voltage induced in coil 3 by the voltage change in the primary counteracts the change in the secondary, coil 4.

d. By these means, the output of the regulated transformer is kept constant with changes of primary input. The output of the transformers is then fed to the selenium rectifier 729 which changes the a-c to pulsating d-c.

e. The rectified output is then fed to the filter unit, which consists of capacitor 712–1, choke coil 702–2, and capacitor 712–2. Adjustable resistor 724 is incorporated so that compensation can be made for any changes of characteristics in selenium rectifier 729 or any other component associated with the transmitter filament supply circuit. The 6 3-volt regulated output is connected to pin 20 of receptacle 734, from which it is connected by Cord CD–1086 to pin 54 of receptacle J102 on the transmitter.

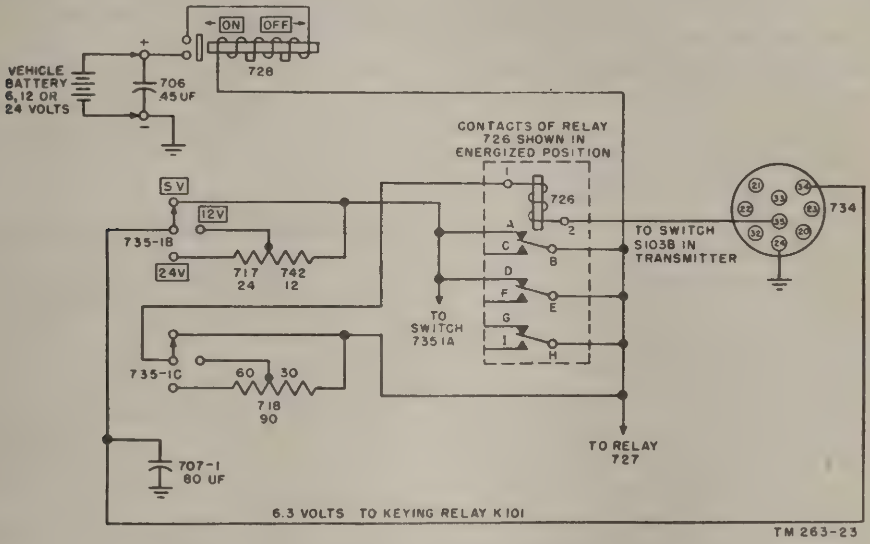

ON
OFF
+
VEHICLE BATTERY 6,12 OR 24 VOLTS
706 45 UF
-
728
CONTACTS OF RELAY 726 SHOWN IN ENERGIZED POSITION
726
1
2
A
B
C
D
E
F
G
H
I
SV
12V
24V
735-1B
717 24
742 12
TO SWITCH S103B IN TRANSMITTER
21
34
33
22
23
35
32
20
24
734
TO SWITCH 735 1A
735-1C
60
30
718 90
707-1 80 UF
TO RELAY 727
6.3 VOLTS TO KEYING RELAY K101
TM 263-23

Figure 90. Vibrator power unit PE–237 voltage supply for keying relay K101, in transmitter, simplified schematic.

124. Transmitter Keying Relay Supply Circuit (fig. 90)

a. Keying relay K101 in the transmitter is fed with 6.3 volts through suitable dropping resistors, directly from the vehicle battery. The current from the battery flows through the coil of circuit breaker 728 to the movable contacts of relay 726.

b. On the SEND position of control Ⓡ in the transmitter, the relay is energized and the movable contacts are in the position shown in figure 90. These movable contacts, B and E, then are in contact with the stationary contacts, A and D, which are connected to voltage-selector switch 735–1B. Switch 735–1B connects to pin 34 of receptacle 734, which is connected by Cord CD–1086 to pin 45 of receptacle J102 in the transmitter. Capacitor 707–1 is placed in the circuit to filter out the vibrator ripple voltage. Switch 735–1C is used to accommodate the coil of relay 726 to a 6-, 12 , or 24-volt vehicular battery.

125. Circuit Changes for Vibrator Power Unit PE–237

a. Capacitors 739–1 and 739–2, which are the filament bypass capacitors for the h-v rectifier tube 1006 filaments, are not supplied in very early models of Vibrator Power Unit PE–237. H-v surge resistor 740 and time delay relay 743 are used only in models having serial Nos. 22436 and up.

b. Another change is the method of operation of rectifier tube 1006. In the late models of the power unit, this tube has its filament heated by voltage from transformer 738, while only four power transformers, 700–1 through 700–4, supply plate voltage to the rectifier tube. In the older models, the filament of the h-v rectifier tube 1006 did not have any voltage applied to it, so it operated as a cold-cathode rectifier, having five power transformers supplying rectifier plate voltage (fig. 140).

c. For models with serial Nos. 501 to 650, on order No. 53906–P–45, the tube is a cold-cathode rectifier. Plate voltage power transformer 700–2 has been disconnected and no longer supplies the rectifier plates. This has been done to reduce the output voltage of the vibrator power unit because of the high battery input voltages found in field service.

d. In still later models, serial Nos. 65 through 1000, order No. 53906–P–45, power transformer 700–2 is used, but transformer 700–5 has been removed. Also, filament supply transformer 738 has been added to supply the voltage for the operation of the filament of tube 1006, thus transforming it into a hot-cathode rectifier. In this model only four transformers supply plate voltage for rectification. The latest model, order No. 10250–Phila–49, serial Nos. 10101 to 14464, inclusive, is also a hot-cathode type with four plate voltage supply transformers for the h-v rectifier.

CHAPTER 6

FIELD MAINTENANCE INSTRUCTIONS

Note. This chapter contains information for field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and equipment available, and by the skill of the repairman.

Section I. PREREPAIR PROCEDURES

Note. The prerepair procedures in this section can be used prior to a complete overhaul of the equipment. If the equipment merely requires trouble shooting and replacement of defective parts, refer to section II of this chapter.

126. Tools, Materials, and Test Equipment

Tools, materials, and test equipment for performing the prerepair procedures in this section are listed below:

Tool Equipment TE–113.
Cleaning fluid: Solvent (SD); Federal Specification P–S–661a.
Test Unit I–176 or
Multimeter TS–352/U.

127. Removal of Pluck-out Parts

a. RECEIVER-TRANSMITTER.

(1) *Tubes and pilot lights.* Follow the instructions given in paragraphs 30 and 31 for the replacement of tubes and pilot lights. Wait until the tubes have cooled off. Some of the transmitter tubes look exactly like the receiver tubes. When replacing the receiver and transmitter tubes, be very sure not to mistake the tubes marked 3A4 with those which are used in the receiver. The 3A4 tubes are used only in the transmitter and not in the receiver. If a receiver tube is placed in a transmitter socket, it will burn out soon after the power is turned on.

Caution: Be sure that all power cables to the receiver-transmitter are removed. There are voltages present which are dangerous to life. The plate cap on power amplifier tube V103 (2E22) has 500 volts on it regardless of the position of the hand key.

(2) *Neon indicator bulb.* Remove the indicator Polaroid lenses by grasping the stationary section (the part nearest the transmitter panel) and unscrew it by turning counterclockwise, as with an ordinary screw. When the lenses are removed, the top of the neon bulb is exposed. The bulb can be removed from its bayonet type socket by pressing it in gently with the pilot lamp puller and twisting it in a counterclockwise direction. Tilt the transmitter panel slightly and the bulb will fall out. The pilot lamp puller is found in Box BX–52–(*). To replace the neon lamp, reverse the above procedure, making sure that the Polaroid lenses are screwed back on tightly.

b. VIBRATOR POWER UNIT PE–237.

(1) To remove the vibrator units in the power supply, take off the top cover to expose the upper side of the chassis (fig. 117). Vibrators VB–1 and VB–16 then can be removed without further disassembly.

(2) Tube 1006 is located under a shield can which is first removed by twisting it in a counterclockwise direction and then pulling it straight up off the tube. The tube then can be removed without any difficulty.

(3) Tube 1005 is held to the chassis by a clamp fitting partly around the base of the tube. The clamp is screwed to the chassis. Loosen the retaining screw

and slide the clamp back off the base of the tube. The tube then can be lifted out without difficulty. The spare tube 1005 also is secured to the chassis in this manner.

c. GENERATOR GN–58–(*). The only pluck-out part in the hand generator is the voltage regulator unit. The top half of the generator housing is fastened to the bottom by clamps (fig. 4). On some models, the clamps are fastened to the bottom half of the housing by screws. These screws must be completely removed before the clamps can be released. Once the top half is lifted off the bottom half of the housing, the voltage regulator unit is clearly seen. Figure 112 shows the regulator for the old models of Generator GN–58–A. This type of regulator has an octal socket and has been superseded with a new type of regulator. The new regulator is used on the latest models of Generator GN–58–A and, by means of an adapter plug, may be inserted into the old models. Within the adapter are resistance units to accommodate the new regulator to the old model generator. The bottom of the adapter has an octal base while the top has 14 holes into which the prongs of the new type regulator are inserted (fig. 91). If the old regulator is known to be defective, remove it and plug the adapter into the octal socket in the generator chassis.

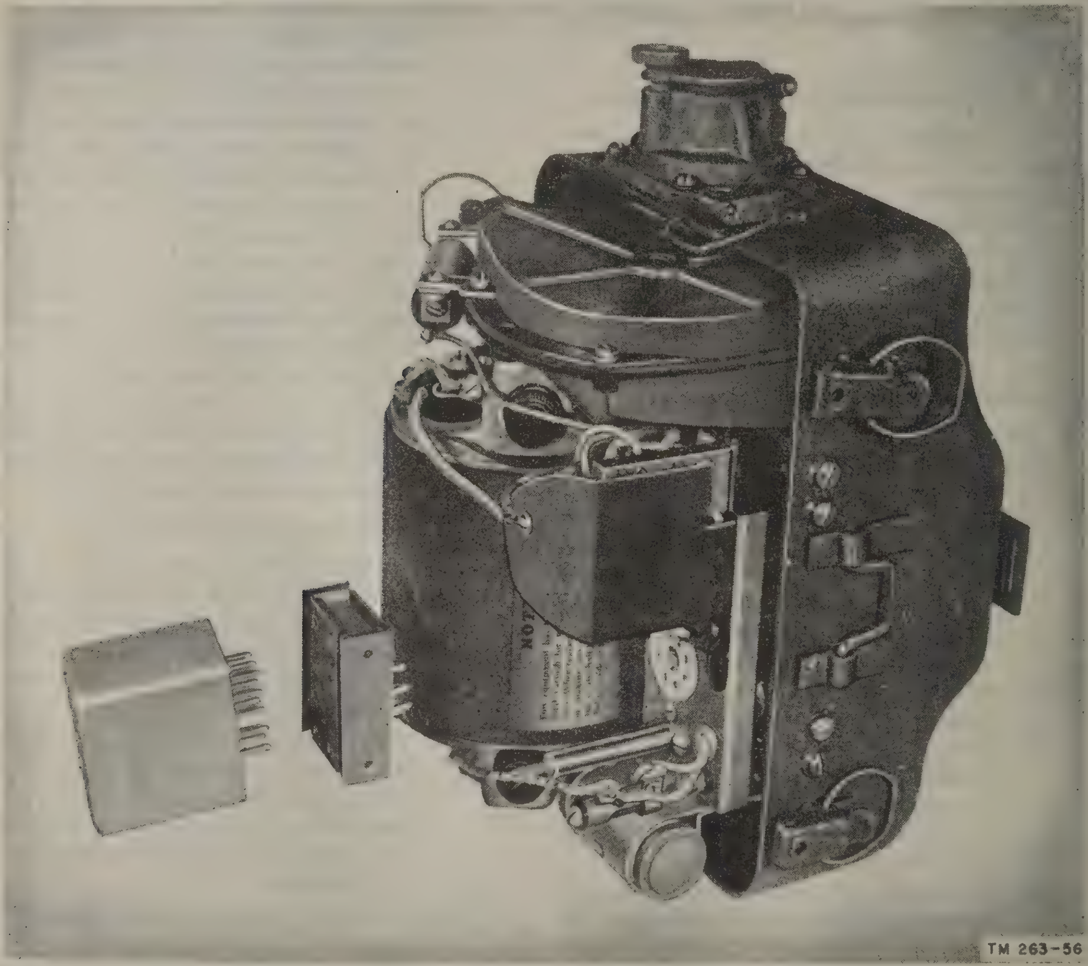


Figure 91. Replacement of early model voltage regulator with later model, in generator GN–58–A (early models), by means of the adapter.

Then place the new type voltage regulator in the adapter. Readjustment of resistor 245 may then be necessary (fig. 137).

128. Cleaning, Inspecting, and Testing Tubes and Pilot Lamps

a. CLEANING. Clean all the tubes with a cloth moistened with solvent (SD); if necessary, clean the grip caps and prongs with crocus cloth.

b. INSPECTING. Inspect the tubes for cracks in glass and base and for bent and broken prongs. Inspect the pilot lamp for continuity of filament, and make sure that the lamp base is not loose. When replacing the pilot lamp, be sure that the lamp is completely inserted in its socket.

c. TESTING. Test the tubes for proper emission, leakage, and short circuits; use a tube tester or place doubtful tubes in a receiver known to be operating normally.

129. Cleaning and Inspecting Chassis Assembly

a. CLEANING. Thorough cleaning of the receiver-transmitter is necessary to insure optimum performance by preventing corrosion, rust, and dust from damaging parts or causing arc-over or low-resistance leakage between h-v points and ground. Remove loose dust and dirt with a brush or blower. With a brush or cloth and solvent (SD), remove dirt and grease which adheres to the chassis and parts. Remove the shield covers from the tube and crystal compartments, and remove all signs of corrosion.

b. INSPECTION. After the unit has been thoroughly cleaned, make a visual inspection of parts and wiring for rust, corrosion, loose connections, frayed and burned insulation, loose screws, and burned or charred resistors and coils. Carefully inspect tube sockets for dirt or bent or broken contacts.

130. Reassembling Receiver-Transmitter

Replace the tubes, pilot light, and neon indicator in their proper sockets. Do not mistake the receiving tubes for the transmitting tubes. When replacing the transmitting crystals, be sure that they are put into the sockets in accordance with the information given in the CRYSTALS chart on the transmitter front panel. Carefully replace the tube and crystal cover plates.

Section II. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning: When servicing Radio Set AN/GRC-9, be careful because of the high voltages exposed. Always disconnect the source of power to the unit before disassembling or doing any testing. For the receiver-transmitter, always pull out the plugs of Cords CD-1086 and CD-1119. If it is necessary to measure high voltages, use the following procedure:

a. Connect the negative lead of the voltmeter to the chassis of the unit so that the connection requires no further attention.

b. Place one hand in your pocket. This will avoid the possibility of electricity traveling through the body, should both hands be across a high voltage.

c. If the voltage is greater than 300 volts (such as the plate cap of tube type 2E22), shut off the power, temporarily ground the terminal to drain off any accumulated charge, then remove the ground from the terminal, connect the positive test lead, step away from the voltmeter, turn on the power, and note the reading on the voltmeter. Do not touch any part of the voltmeter, particularly when it is necessary to measure the voltage between two points which are both above ground.

131. Trouble-Shooting Procedures

The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the *major component or circuit* responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal condition. Some faults such as burned-out resistors, r-f arcing, and shorted transformers often can be located by sight, smell, and sound. The majority of faults, however, must be localized by *checking voltage and resistance.*

a. SYSTEM SECTIONALIZATION. System sectionalization is discussed in paragraph 76.

b. COMPONENT SECTIONALIZATION AND LOCALIZATION. The tests listed below aid in isolating the source of trouble. To be effective, the procedure should be followed in the order given.

Remember that the servicing procedure should cause no further damage to the receiver. First, trouble should be localized to a single stage or circuit. Then the trouble may be isolated within that stage or circuit by appropriate voltage, resistance, and continuity measurements. The service procedure is summarized as follows:

(1) *Visual inspection.* The purpose of visual inspection (par. 75) is to locate any visible trouble. Through this inspection alone, the repairman may frequently discover the trouble or determine the stage in which the trouble exists. This inspection is valuable in avoiding additional damage to the receiver which might occur through improper servicing methods and in forestalling future failures.

(2) *Input resistance measurements.* These measurements (par. 135) prevent further damage to the receiver from possible short circuits. Since this test gives an indication of the condition of the filter circuits, its function is more than preventive.

(3) *Operational test.* The operational test (par. 136) is important because it frequently indicates the general location of trouble. In many instances the information gained will determine the exact nature of the fault. In order to utilize this information fully, all symptoms must be interpreted in relation to one another.

(4) *Trouble-shooting chart.* The trouble symptoms listed in this chart (par. 137) will aid greatly in localizing trouble.

(5) *Signal substitution.* The principal advantage of the signal substitution method (par. 143) is that it usually enables the repairman to localize a trouble accurately and quickly to a given stage when the general location of the trouble is not immediately evident from the above tests.

(6) *Intermittents.* In all these tests, the possibility of intermittents should not be overlooked. If present, this type often may be made to appear by tapping or jarring the set. It is possible that the trouble is not in the radio set itself but in the installation (mounting, cabling system, or vehicle), or the trouble may be due to external conditions. In this event, test the installation if possible.

132. Trouble-Shooting Data

Take advantage of the material supplied in this manual. It will help in the rapid location of faults. Consult the following trouble-shooting data:

a. RECEIVER SECTION OF RECEIVER-TRANSMITTER RT–77/GRC–9.

Fig. or par. No.	Description
Fig. 138	Receiver section of Receiver-Transmitter RT–77/GRC–9, schematic diagram.
Fig. 56	Antenna switching and tuning circuits for receiver.
Fig. 64	Receiver filament supply circuits.
Fig. 65	Receiver plate and screen grid voltage supply circuits.
Fig. 94	Receiver top, parts location.
Fig. 92	Receiver power receptacle J3.
Fig. 93	Transmitter POWER socket resistances to ground.
Fig. 95	Receiver transformer and electrolytic capacitor terminal designations.
Fig. 96	Receiver bottom, parts location.
Fig. 97	Receiver bottom, parts location.
Fig. 98	Receiver bottom, parts location.
Fig. 99	Receiver tube socket, voltage and resistance diagram.
Fig. 100	Location of wafer sections of switch S3.
Par. 142	D-c resistances of transformers and coils.

b. TRANSMITTER SECTION OF RECEIVER-TRANSMITTER RT–77/GRC–9.

Fig. or par. No.	Description
Fig. 101	Transmitter capacitor and dial retaining screws.
Fig. 102	Location of screws A and B.
Fig. 103	Back panel of transmitter shown swung up to expose tuning capacitor.
Fig. 104	Transmitter parts location (top).
Fig. 105	Transmitter parts location (bottom).
Fig. 106	Transmitter parts location (bottom).
Fig. 107	Transformer pin designation on transmitter.
Fig. 108	Transmitter tube socket voltage and resistance diagram.
Fig. 109	Transmitter wafer switch sections.
Par. 150	D-c resistance of transmitter coils and transformers.

c. GENERATOR GN–58–(*).

Fig. or par. No.	Description
Fig. 137	Generator GN–58–A (late models) (serial Nos. 10101 through 14464), schematic diagram.
Fig. 110	Generator GN–58–(*), disassembly illustration.
Fig. 111	Generator GN–58–(*), removed from bottom half of housing.
Fig. 112	Generator GN–58–(*), parts location (top).
Fig. 113	Generator GN–58–(*), parts location (bottom).
Par. 154	D-c resistances of Generator GN–58–(*) choke coils.
Fig. 136	Generator GN–58–A (early models), schematic diagram.
Fig. 135	Generator GN–58, schematic diagram.

d. VIBRATOR POWER UNIT PE–237.

Fig. or par. No.	Description
Fig. 114	Vibrator Power Unit PE–237, terminal board and battery cable connections.
Fig. 117	Vibrator Power Unit PE–237 (serial Nos. 22436 through 26799), top view for parts identification purposes.
Fig. 118	Vibrator Power Unit PE–237 (serial Nos. 22436 through 26799), bottom view for parts identification purposes.
Fig. 119	Shielded compartment for stand-by vibrator socket and filter unit, viewed from bottom of chassis.
Fig. 120	Shielded compartment for h-v vibrator socket and filter unit, viewed from bottom of chassis.
Fig. 121	Inside view of door cover for h-v filter compartment.
Fig. 122	Vibrator Power Unit PE–237 transformer and choke coil terminal designations.
Fig. 140	Vibrator Power Unit PE–237 (early models), schematic diagram.
Fig. 141	Vibrator Power Unit PE–237 (late models, serial Nos. 22436 through 26799), schematic diagram.

133. Test Equipment Required for Trouble Shooting

The test equipment required for trouble shooting Radio Set AN/GRC–9 is listed below. The technical manuals associated with the test equipment are also listed.

Test equipment	Technical manual
Signal Generator I–72 or equal	TM 11–307
Oscillator I–151 or equal	TM 11–2524
Tube Tester I–177 or equal	TM 11–2627
Test Unit I–176 or Multimeter TS–352/U.	TM 11–2626 TM 11–5527 (TO 16–35TS352–3)

134. General Precautions

Whenever the receiver-transmitter is serviced, observe the following precautions very carefully:

a. Be careful when the cover is removed; dangerous voltages are exposed.

b. Careless replacement of parts often makes new faults inevitable. Note the following points:

(1) Before a part is unsoldered, note the position of the leads. If the part, such as a transformer, has a number of connections, tag each of the leads to it.

(2) Be careful not to damage other leads by pulling or pushing them out of the way.

(3) Do not allow drops of solder to fall into the set, since they may cause short circuits.

(4) A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

(5) When a part is replaced in r-f or i-f circuits, it must be placed exactly as the original one was. A part which has the same electrical value but different physical size may cause trouble in h-f circuits. Give particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to observe these precautions may result in decreased gain or possibly in oscillation of the circuit.

(6) Do not disturb the adjustment of calibration control C102.

(7) Avoid displacing any leads when getting at a particular component. If it is unavoidable, move the lead, but replace it in its original position after the faulty component has been replaced.

135. Checking Filament and B+ Circuits for Shorts

Trouble within the receiver or transmitter often may be detected by checking the resistance of the filament and h-v circuits before applying power to the equipment, thereby preventing damage to the power supply. Make the following checks before attempting to put the receiver-transmitter into operation.

a. Receiver Filament and Plate Circuits (figs. 64, 65, and 92). Remove the receiver-transmitter interconnecting cable from the socket in back of the receiver chassis. The resistances to be obtained between ground and terminals 3, 4, and 6 are clearly shown in figure 92. If these readings are not obtained, *do not* supply power to the radio set, but trace the circuits to see where the shorts or opens are located. If this is not done, the power supply may be damaged.

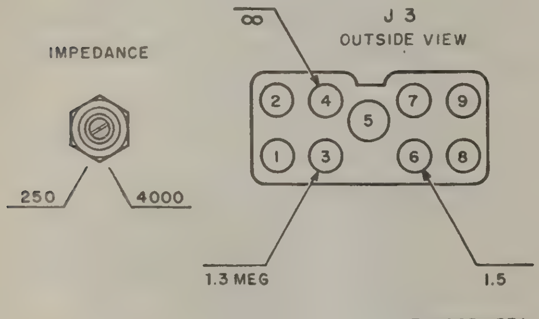

∞
J 3
OUTSIDE VIEW
IMPEDANCE
2
4
5
7
9
1
3
6
8
250
4000
1.3 MEG
1.5
TM 263-57A

Figure 92. Receiver power receptacle J3.

b. Transmitter Power Supply Circuits (figs. 80, 81, 82, and 93). Disconnect power cables, Cords CD-1086 and CD-1119, from the transmitter and remove the key and microphone from their jacks. Check the resistances to ground of the contacts of the transmitter POWER socket (fig. 93). If the readings shown are not obtained, *do not* apply power to the radio set; trace the circuits to see where the trouble is located. Otherwise, damage may be done to the power supply. Correct all conditions leading to abnormal readings before applying power to the radio set.

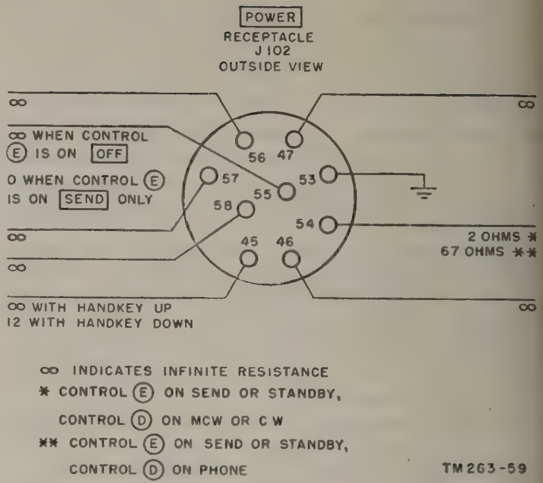

POWER
RECEPTACLE
J 102
OUTSIDE VIEW
∞
∞
∞ WHEN CONTROL Ⓔ IS ON OFF
0 WHEN CONTROL Ⓔ IS ON SEND ONLY
∞
∞
∞ WITH HANDKEY UP
12 WITH HANDKEY DOWN
56
47
57
53
55
58
54
45
46
2 OHMS *
67 OHMS **
∞
∞ INDICATES INFINITE RESISTANCE
* CONTROL Ⓔ ON SEND OR STANDBY, CONTROL Ⓓ ON MCW OR C W
** CONTROL Ⓔ ON SEND OR STANDBY, CONTROL Ⓓ ON PHONE
TM 263-59

Figure 93. Transmitter power socket resistances to ground.

136. Operational Test

a. If the foregoing tests in paragraph 135 have not shown any abnormal readings, connect the power supply to the radio set and set up the unit for normal operation. Refer to the equipment performance checklist in paragraph 77 and operate the set as described in the checklist. This step is important because it frequently indicates the general location of trouble. Also listen for crackling or buzzing noises, which indicate h-v arcing.

b. In some of the tests to be described later, it may be desirable to use a dummy antenna instead of an actual radiator. The dummy antenna for transmitter tests is a 20-ohm noninductive resistor in series with a 70-uuf (micro-microfarad capacitor and an 0 to 2 amperes r-f meter. This is equivalent to a 15-foot whip antenna. Connect the meter end to the chassis or GND. post on the receiver. The resistor end connects to the ANT. post on the transmitter.

Note. A 5,400-ohm noninductive resistor is equivalent to a half-wave antenna (control Ⓐ in REEL position).

137. Trouble-shooting Charts

The following nine trouble-shooting charts are supplied as an aid in locating trouble in the equipment.

a. The chart in paragraph 138 covers sectionalizing trouble in Radio Set AN/GRC-9; it lists the various symptoms which may be easily recognized and gives the probable location of the existing trouble as well as the recommended correction. The chart also tells the operator if the trouble is in the transmitter section, receiver section, power supply, or antenna. By proper use of the charts, the operator can readily recognize troubles that may occur in the components of the equipment.

b. The chart in paragraph 139 covers sectionalizing trouble in the receiver section of the receiver-transmitter. This chart will aid in determining which stage in the receiver is at fault.

c. The chart in paragraph 140 is to be used to localize trouble in the receiver to an individual *part* within the faulty stage.

d. The chart in paragraph 147 is similar to paragraph 139, except that it deals with sectionalizing trouble in the transmitter section of the radio set.

e. The chart in paragraph 148 localizes the trouble in the transmitter to an individual part *within* the faulty stage.

f. The chart in paragraph 151 sectionalizes trouble in the hand generator.

g. The chart in paragraph 153 localizes trouble in the hand generator.

h. The chart in paragraph 155 sectionalizes trouble in the vibrator power unit.

i. The chart in paragraph 157 localizes trouble in the vibrator power unit.

138. Sectionalizing Trouble in Radio Set AN/GRC–9

Symptom	Probable trouble	Correction
1. All controls in correct position for operation of receiver and transmitter, but neither operates; dial lights do not light.	1*a.* Cord CD–1086 defective	1*a.* Replace Cord CD–1086.
	b. Power supply defective	*b.* See charts for Vibrator Power Unit PE–237 or Generator GN–58–(*).
	c. If only transmitter panel light works, and only Generator GN–58–(*) is being used, control Ⓔ may not be on send.	*c.* Turn control Ⓔ to SEND.
2. Transmitter normal. Receiver does not operate.	2*a.* Headset plug not fully inserted in PHONES jack.	2*a.* Push in headset plug.
	b. Open circuit in headset	*b.* Replace headset; repair defective unit.
	c. Open or shorted interconnecting cable between transmitter and receiver.	*c.* Remove receiver-transmitter from the case and check the cable.
	d. If a hum, but no signal is heard in the headset, touch the antenna lead-in to lug 8 of the receiver power socket in back of the receiver chassis. If still no signal is heard, the receiver requires major repairs. If the signal is heard, the transmitter requires inspection.	
3. Transmitter normal, receiver weak.	3*a.* If Battery BA–48 is being used, it may be weak.	3*a.* Replace Battery BA–48.
	b. Poor antenna installation or location.	*b.* Increase antenna height. Change location.
	c. Check for correct position of IMPEDANCE switch S4 for headset in use.	*c.* Place switch S4 on correct position for headset being used.
	d. Receiver switch control Ⓛ on NET.	*d.* Change control ○ to PHONE or C.W. position.
	e. Defective receiver tubes	*e.* Replace receiver tubes.
	f. Check voltage output of power supply.	*f.* See power supply charts.
	g. Major trouble in receiver	*g.* See receiver charts.
4. Receiver normal, transmitter dead.	4*a.* Control Ⓔ not on SEND	4*a.* Turn control Ⓔ to SEND.
	b. Check voltage output of power supply.	*b.* See power supply charts.
	c. Turn control Ⓓ to PHONE and depress key. Listen for relay K101	*c.* See transmitter charts.

138. Sectionalizing Trouble in Radio Set AN/GRC–9—*Continued*

Symptom	Probable trouble	Correction
	clicking. With key closed, depress DIAL LIGHT control Ⓙ. If it does not light, then relay K101 is probably at fault.	
	d. Check metering socket voltages according to chart in back of transmitter.	*d.* See transmitter charts.
5. Receiver normal, transmitter weak.	5*a.* Check metering socket voltages	5*a.* See transmitter charts.
	b. Defective transmitter tubes	*b.* Replace tubes.
	c. If transmitter is normal on either MO or XTAL operation, but not both, transmitter is at fault.	*c.* See transmitter charts.

139. Sectionalizing Trouble in Receiver Section

(figs. 64, 65, and 138)

Symptom	Probable trouble	Correction
1. Receiver dead. Tubes and dial light do not light up.	1*a.* PHONES jacks dirty or broken	1*a.* Repair, clean, or replace PHONES jacks.
	b. Shorted selenium voltage regulator CR1.	*b.* Replace selenium voltage regulator CR1.
	c. Shorted capacitor C24	*c.* Replace capacitor C24.
	d. Shorted capacitor C34A	*d.* Replace capacitor C34A.
	e. Shorted DIAL LIGHT switch S2	*e.* Replace switch S2.
	f. One of the tube filaments is shorted.	*f.* Check tubes.
2. Signals very weak, with volume controls on full maximum position.	2*a.* The alinement of one or several stages is off.	2*a.* Use signal substitution check (pars. 145 and 146).
	b. Tube plate and screen grid voltages are low.	*b.* Use signal substitution check (par. 145) to find which weak stages are not supplied with full voltage.
	c. Faulty tubes	*c.* Check tubes.
	d. If signals are normal, with loud volume, on C.W. position of control Ⓛ, resistor R16 or capacitor C33 may be open.	*d.* Replace resistor R16 or capacitor C33.
3. Reception badly distorted	3*a.* Defective tubes	3*a.* Check tubes for gas.
	b. Defective headset	*b.* Replace the headset.
	c. Incorrect bias voltage on the audio stages. Leaky bias resistor, bypass capacitors, and coupling capacitors. Shorted or open bias resistors.	*c.* Use headset with .1-uf capacitor in series with one lead to localize the faulty stage, then refer to paragraph 140 to find the defective component.
	d. Defective bias cell BT1 in signal grid circuit of tube V6. Check the cell, *only with a vacuum-tube voltmeter.* It should produce 4 to 6 volts.	*d.* Replace bias cell BT1.
	e. Incorrect plate and screen grid voltages on the tubes.	*e.* Check plate and screen grid d-c voltages (par. 141).
4. Constant, objectionable hum, buzzing, or sizzling in receiver output on all bands.	4*a.* Power supply filter units defective. Vibrator Power Unit PE–237 and Vibrator VB–16 or VB–1 defective. Generator GN–58–(*) regulator not functioning properly.	4*a.* Change power supplies or operate radio receiver on Battery BA–48 alone. If symptoms clear up, see chart for appropriate power supply.
	b. One of the plate or screen grid	*b.* Replace the faulty resistor.

139. Sectionalizing Trouble in Receiver Section—*Continued*
(figs. 64, 65, and 138)

Symptom	Probable trouble	Correction
	resistors may be defective. Look for burned, charred, discolored, or blistered resistors.	
	c. Dirty contacts in the A. F. GAIN or R. F. GAIN control. Look for dirt on the shafts.	*c.* Replace the control.
	d. Leaky coupling capacitors in audio circuits.	*d.* Test and replace faulty capacitor.
5. Oscillation, whistling, squeals, and motorboating.	5*a.* The antenna may be too short because the correct number of jumpers are not closed.	5*a.* Close the jumpers in accordance with the calibration chart.
	b. Open plate supply and screen grid bypass capacitors. Momentarily, short these capacitors with others of equal capacity, known to be good: C34B, C40, C43, C55, C50, C46, C35, C30, and C9. Check choke coil L16, in the filament circuit of tube V2, for shorts.	*b.* Replace those capacitors found to be open. Replace choke coil L16.
	c. When a previous repair job has been completed, some of the wiring in the r-f and i-f circuits may have been displaced. Placing plate leads close to grid leads causes oscillation.	*c.* Place all leads differing in h-f potential as far apart as possible. Leads differing in d-c potential do not matter, as long as they are adequately bypassed to ground.
	d. Check the tubes for gas	*d.* Replace the defective tube.
	e. Incorrect plate and screen grid voltages.	*e.* Replace defective components.
	f. Incorrect tracking of h-f oscillator with r-f tuning stages.	*f.* Refer to alinement (par. 168).
6. Intermittent operation. Abrupt cutting in and out.	6*a.* Defective tube. Resistor or capacitor opens intermittently. Loose wiring.	6*a.* With an insulated prod, tap all tubes, resistors, capacitors, soldered connections, and transformer shield cans.
	b. One of the stages is not working	*b.* Use signal substitution method in paragraph 143.
7. Periodic fading when radio set is not on a moving vehicle.	7*a.* Defective tube	7*a.* Do not check the tubes, as a tube may check very well in a tube tester but may not be suitable in the receiver. Replace all tubes with those known to be in good condition.
	b. Open grid leak resistors	*b.* Check the resistance of the following resistors: R1, R6, R16, R18, and R19B.
	c. Antenna may be swaying in the wind.	*c.* Secure guy wires.
	d. AVC inoperative	*d.* Refer to receiver trouble localization chart (tube V5).
	e. Atmospheric disturbances	*e.* Use long-wire antenna and orientate it in the direction of the station desired.
8. Fading or intermittents on C.W. and CAL. positions only.	8*a.* Open capacitor C51	8*a.* Momentarily, parallel capacitor C51 with a capacitor of equal capacity.
	b. Bfo intermittent	*b.* Refer to paragraph 140, No. 31.
9. No beat note heard on CAL., but receiver normal, otherwise.	9*a.* Capacitor C36 open	9*a.* Momentarily, place a capacitor of the same capacity in parallel with capacitor C36.

139. Sectionalizing Trouble in Receiver Section—*Continued*
(figs. 64, 65, and 138)

Symptom	Probable trouble	Correction
	b. 200 kc. Crystal I1 defective	*b.* Replace Crystal I1.
	c. Crystal-oscillator circuit defective	*c.* Refer to receiver trouble localization chart (tube V4).

140. Localizing Trouble in Receiver Section

Symptom	Probable trouble	Correction
R-F AMPLIFIER V1 (1L4).		
1. No signal passes through. Voltages are normal.	1*a.* Capacitor C8 open	1*a.* Momentarily, parallel capacitor C8 with one of equal capacity.
	b. Capacitor C7A shorted	*b.* Check variable air capacitor plates for dirt, dust, burs, and direct shorts.
	c. Capacitor C36 shorted	*c.* Momentarily, unsolder capacitor C36 from pin 6 of the r-f amplifier (V1).
	d. Resistor R1 open	*d.* Check resistor R1.
	e. Check trimmers and the secondaries of transformer T2 for shorts.	*e.* Clean out any dust and dirt. Remove shorts.
	f. Tube V1 shorted internally	*f.* Replace tube V1.
2. Incorrect d-c voltage on pin 2 for all three bands.	2*a.* Capacitor C10 shorted	2*a.* Replace capacitor C10.
	b. Resistor R2 open or shorted	*b.* Replace resistor R2.
	c. Open switch S1C	*c.* Repair or replace switch S1C.
	d. The primary coil for that band is open.	*d.* Repair or replace transformer T2.
3. Incorrect d-c voltage on pin 3.	3*a.* Capacitor C9 shorted	3*a.* Replace capacitor C9.
	b. Resistor R11 open	*b.* Replace resistor R11.
4. Incorrect d-c voltage on pin 7.	4*a.* If all tubes but V1 light, then the connection to pin 7 is broken.	4*a.* Trace lead to pin 7.
	b. If all tubes do not light refer to paragraph 139.	*b.* Refer to paragraph 139.
CONVERTER TUBE V2 (1R5):		
5. No signal passes through. Voltages are normal. Noise heard in headset.	5*a.* Switch S1D (rear) is dirty or open	5*a.* Repair or replace switch S1D.
	b. Capacitor C28 is open	*b.* Momentarily, parallel capacitor C28 with a capacitor of equal capacity.
	c. Resistor R6 open	*c.* Momentarily, parallel resistor R6 with one of equal resistance.
	d. Capacitor C31 shorted	*d.* Replace capacitor C31.
	e. Oscillator section of the converter tube V2 is not oscillating.	*e.* If the oscillator section is operating correctly, there will be a voltage of minus 4.5 volts with respect to ground on pin 4 of tube V2. Check this negative voltage with a VTVM *only*.
	f. Components in oscillator grid circuit from pin 4 of converter tube V2 to ground may be faulty.	*f.* Check the resistances from pin 4 to ground of the converter tube V2 on each of the three bands.

Position of control Ⓜ	Resistance from pin 4 to ground
BAND 1	103,000 ohms.
BAND 2	276,000 ohms.
BAND 3	276,000 ohms.

140. Localizing Trouble in Receiver Section—*Continued*

Symptom	Probable trouble	Correction
		If these values are not obtained, check resistors R7, R3, R4, and R5. Replace transformer T3.
	g. Defective converter tube V2 (1R5).	*g*. Do not check the tube, but replace it with two or three different ones. If the oscillator section still does not work, reinsert the original tube.
	h. Oscillator coils may not be tracking correctly.	*h*. See alinement section on receiver (par. 164).
6. Incorrect d-c voltage on pin 2.	6. Open primary of i-f transformer T4.	6. Check the resistance of primary of transformer T4 (lugs 3 and 2) (par. 142).
7. Incorrect d-c voltage on pin 3.	7*a*. Resistor R8 opens	7*a*. Check resistor R8.
	b. Capacitor C30 shorted	*b*. Remove capacitor C30 and replace with one of equal value.
8. Incorrect d-c voltage on pin 7.	8. Open or shorted choke L16	8. Remove converter tube V2, and check coil L16 for open or short.
FIRST I-F AMPLIFIER V3 (1L4):		
9. No signal passes through. Voltages are normal.	9*a*. Open in secondary of transformer T4 or shorted primary of transformer T5.	9*a*. Check transformer resistances (par. 142).
	b. If signal comes through with normal volume on C.W. position of control Ⓛ but not on PHONE, check signal grid return resistor R16 for open (return resistor).	*b*. Turn control Ⓛ to PHONE and check resistor R16.
	c. Capacitor C35 open	*c*. Momentarily, short capacitor C35 with one of equal capacity.
	d. Transformer T4 or T5 misalined	*d*. Refer to paragraph 166.
10. Incorrect d-c voltage on pin 2.	10*a*. Open or shorted primary of transformer T5.	10*a*. Check transformer T5 primary resistance.
	b. Capacitor C37	*b*. Replace capacitor C37.
11. Incorrect d-c voltage on pin 3.	11*a*. Open resistor R12 shorted capacitor C35.	11*a*. Replace defective component.
	b. Open switch S3–2	*b*. Check the voltage from pin 3 of the r-f amplifier tube V1 to ground. If it is normal, then switch S3–2 is probably defective.
	c. Open or shorted R. F. GAIN control Ⓟ (R9).	*c*. Check control Ⓟ.
SECOND I-F AMPLIFIER AND CRYSTAL OSC V4 (1R5):		
12. No signal passes through. Voltages normal. Switch Ⓛ on PHONE or C.W. position.	12*a*. Open or shorted secondary of transformer T5. Shorted primary of transformer T6. Shorted capacitor C38, C44, or C43.	12*a*. Check and replace faulty components.
	b. Faulty ground connection to lug 4 of transformer T5.	*b*. Check, clean, and tighten the ground connection to lug 4.
	c. Capacitor C46 open	*c*. Short capacitor C46 with one of equal capacity.
	d. Transformer T5 or T6 misalined	*d*. Refer to paragraph 166.
13. Signal passes, but reduced in volume.	13. Transformer T5 or T6 misalined	13. Refer to paragraph 166.
14. Control Ⓛ on CAL. No beat note heard in headset. Set normal when on C.W. or PHONE.	14. Crystal oscillator section not functioning. With a VTVM, check for a negative voltage to ground on pin 4 of tube V4. If no negative voltage or	

140. Localizing Trouble in Receiver Section—*Continued*

Symptom	Probable trouble	Correction
	a positive voltage is obtained, the circuit is not operating.	
	a. Crystal unit defective	*a.* Replace crystal unit.
	b. Tube V4 defective	*b.* Try two or three replacements; if the oscillator still does not work, reinsert the original tube.
	c. Faulty resistor R13	*c.* Turn control Ⓛ to CAL. and check resistance of resistor R13.
	d. Capacitors C39 and C42 open or shorted.	*d.* Check capacitors C39 and C42.
	e. Coil T7 open	*e.* Check continuity of coil T7.
15. Incorrect d-c voltage on pin 2.	15*a.* Primary of transformer T6 open	15*a.* Check primary resistance.
	b. Resistor R15 open	*b.* Check resistance of resistor R15.
	c. Capacitor C43 shorted	*c.* Replace capacitor C43.
16. Incorrect d-c voltage on pin 3 in CAL. position of control Ⓛ.	16*a.* Resistor R14 open	16*a.* Check for resistance from terminals 2 to 4 on transformer T7.
	b. Capacitor C41 shorted	*b.* Replace capacitor C41.
17. No d-c voltage on pin 7. All other tubes normal.	17. Filament open or shorted	17. Replace tube V4.
DETECTOR SECTION OF TUBE V5 (1S5):		
18. No signal passes through. Voltages on tube are normal.	18*a.* Open circuit in secondary of transformer T6.	18*a.* Check resistance of secondary.
	b. Capacitors C49 and C48 open or shorted.	*b.* Check these components and replace if necessary.
	c. Resistor R17, R18, or A. F. GAIN control ◎ (R19A) may be open.	*c.* Turn control Ⓛ to PHONE and check the resistance of each resistor individually.
19. Signal comes through badly distorted. Voltages on tube are normal.	19*a.* One of resistors R17, R18, or R19A has changed in value.	19*a.* Turn control Ⓛ to PHONE and check each resistor individually.
	b. Capacitor C49, C47, C33, or C48 shorted or open.	*b.* Check component.
	c. Secondary of transformer T6 misalined.	*c.* Refer to paragraph 166.
A-F AMPLIFIER SECTION OF TUBE V5 (1S5):		
20. No signal passes through. Tube voltages are normal.	20*a.* A. F. GAIN control ◎ may be open or shorted to ground.	20*a.* Check the resistance of R19A.
	b. Defective tube	*b.* Replace tube.
	c. Capacitor C52 leaking	*c.* Replace capacitor C52.
	d. Capacitor C53 open	*d.* Momentarily, short capacitor C53 with one of equal capacity.
21. Oscillations, motorboating, and squeals.	21*a.* Plate and signal grid leads may be too close together.	21*a.* Gently separate these leads as far apart as is possible.
	b. Capacitor C52 open	*b.* Momentarily, short capacitor C52 with one of equal capacity.
	c. Capacitor C34B open	*c.* Momentarily, short capacitor C34B with one of equal capacity.
	d. Capacitor C57 (plate bypass for tube V6, 3Q4) may be open.	*d.* Momentarily, short capacitor C57 with one of equal capacity.
	e. Capacitor C48 may be shorted	*e.* Replace capacitor C48.
22. Incorrect d-c voltage on pin 4. Other tubes normal.	22*a.* Resistor R20 open	22*a.* Check resistor R20.
	b. Capacitor C50 shorted	*b.* Remove capacitor C50.
23. Incorrect d-c voltage on pin 5.	23*a.* Resistor R21 defective	23*a.* Replace resistor R21.
	b. Capacitor C52 shorted	*b.* Replace capacitor C52.
	c. Resistor R29 open	*c.* Check resistor R29.
	d. Capacitor C34B shorted	*d.* Replace C34B.

140. Localizing Trouble in Receiver Section—*Continued*

Symptom	Probable trouble	Correction
	e. Primary coil of transformer T9 may be shorted to ground.	*e.* Take a resistance check from terminal 5 on transformer T9 to ground. There should be infinite (∞) impedance. Be sure however, that capacitor C34B is not shorted or transformer may be wrongly suspected.
24. No voltage on pin 7	24. Defective tube	24. Check tube.
SECOND AUDIO AMPLIFIER V6 (3Q4):		
25. No signal passes through. Tube voltages are normal.	25*a.* A. F. GAIN control Ⓞ (R19B) open or shorted.	25*a.* Check potentiometer R19B.
	b. Bias cell BT–1 defective	*b.* Replace bias cell BT–1.
	c. Tube defective	*c.* Replace tube.
	d. Capacitor C57 shorted or leaky	*d.* Replace capacitor C57.
	e. Primary of output transformer T9 shorted.	*e.* Check resistance between terminals 2–5 on transformer T9.
26. Signal badly distorted. Voltages normal.	26*a.* Capacitor C54 open or shorted	26*a.* Replace capacitor C54.
	b. Capacitor C53 leaking	*b.* Replace capacitor C53.
	c. Capacitor C57 defective	*c.* Replace capacitor C57.
	d. Tube gassy	*d.* Replace tube.
	e. DIAL LIGHT-PUSH control Ⓚ defective.	*e.* When DIAL LIGHT-PUSH control Ⓚ is not depressed, be sure that both sides of tube 3Q4 filament light.
27. Signal output very low. Volume controls in maximum position. Voltages normal. Headset normal.	27*a.* Output IMPEDANCE switch S4 in incorrect position.	27*a.* For the following reproducers turn IMPEDANCE control to: Loudspeaker LS–7 — 4000 Headset HS–30–(*) — 250
	b. Capacitor C55 open	*b.* Momentarily, short capacitor C55 with one of equal capacity.
	c. Tube V6 (3Q4) defective	*c.* Replace tube V6 (3Q4).
	d. Capacitor C56 leaky	*d.* Replace capacitor C56.
	e. Capacitor C34B open	*e.* Replace capacitor C34B.
	f. If the sidetone signal also is low, the trouble is probably in the output impedance-matching transformer T9.	*f.* Check the coil resistances of the transformer.
	g. Capacitor C61 shorted	*g.* Replace capacitor C61.
	h. PHONES jacks J1 and J2 defective.	*h.* Inspect and clean PHONES jacks J1 and J2.
28. Incorrect d-c voltage on pins 2 and 6. All other tubes are normal.	28*a.* Primary of transformer T9 open or shorted to ground.	28*a.* Check primary resistance, and resistance between terminals 5 and 4 which should be infinite (∞).
	b. Capacitor C57 shorted or leaking	*b.* Replace capacitor C57.
	c. Capacitor C56 shorted or leaking	*c.* Replace capacitor C56.
29. Incorrect d-c voltage on pin 4. All other tubes are normal.	29*a.* Resistor R23 shorted or open	29*a.* Replace resistor R23.
	b. Capacitor C55 is shorted	*b.* Replace capacitor C55.
30. Incorrect d-c voltage on pin 7.	30*a.* DIAL LIGHT-PUSH control Ⓚ (S2) open or shorted.	30*a.* Check switch S2.
	b. Tube V6 (3Q4) defective	*b.* Replace tube V6 (3Q4).
BFO TUBE V7 (1R5):		
31. Bfo inoperative. No tone is heard on C.W. or CAL. position. PHONE operation is normal. All d-c voltages are normal.	31*a.* Turn switch Ⓛ to C.W. With a VTVM, take voltage reading from pin 4 to ground of tube V7 (1R5). Pin 4 should be 10 volts *below* ground potential. If reading obtained shows pin 4 to be much less than –10 volts	31*a.* See symptom 31b in probable trouble column. If correct reading is obtained, check capacitor C51 for a possible open circuit.

140. Localizing Trouble in Receiver Section—*Continued*

Symptom	Probable trouble	Correction
	or even positive, then the bfo circuit is not oscillating.	
	b. Tube V7 (1R5) defective	*b.* Replace tube V7 (1R5). Checking not necessary.
	c. Resistor R25 may be open	*c.* Short resistor R25 with one of equal value.
	d. Coil T8 may be open or shorted	*d.* Make resistance checks on the terminals of coil T8. Replace coil T8 if another unit is available.
	e. Capacitor C60 may be open	*e.* Short capacitor C60 with one of equal value.
	f. Coil T8 not alined	*f.* Refer to paragraph 167.
32. Incorrect d-c voltage on pin 2. All other tubes are normal.	32. Resistor R22 open or shorted	32. Replace resistor R22.
33. Incorrect d-c voltage on pin 3. All other tubes normal. Control ⓛ on C.W. or CAL.	33*a.* Part of coil T8 open	33*a.* Check the resistance between terminals 2 and 4 of coil T8.
	b. Capacitor C60 shorted	*b.* Replace capacitor C60.
	c. Resistors R26 and R27 defective	*c.* Replace resistors R26 and R27.
	d. Tube V7 (1R5) internally shorted	*d.* Replace tube V7 (1R5).
34. No d-c voltage on pin 7. All other tubes normal.	34*a.* Short or open in the supply line to tube V7.	34*a.* Remove tube V7 and check for zero resistance between pin 7, of socket V7 and pin 7 of tube V4 (1R5).
	b. Tube V7 (1R5) defective	*b.* Replace tube V7 (1R5).

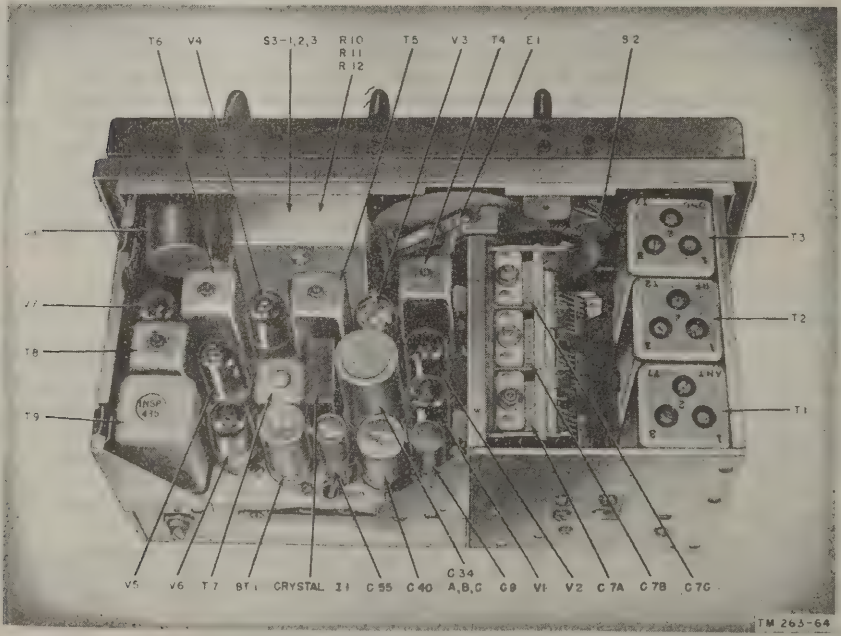


Figure 94. Receiver top, parts location.

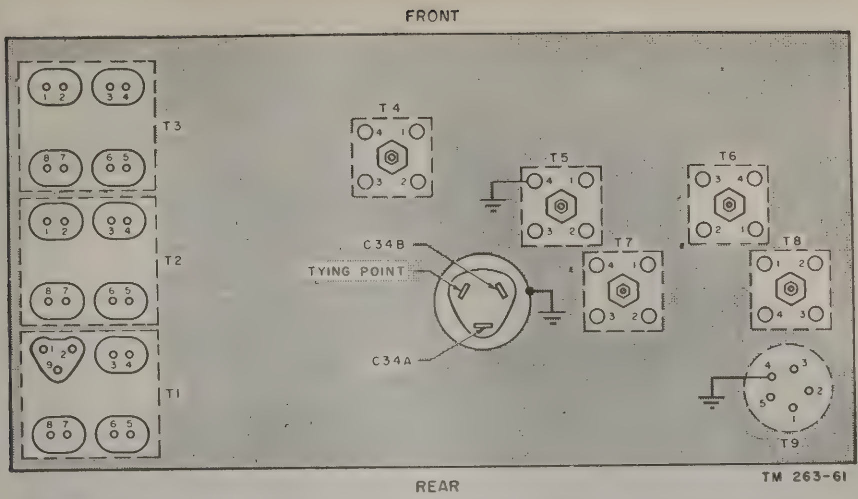

FRONT
T4
4
1
3
2
T5
4
1
3
2
T6
3
4
2
1
T3
1 2
3 4
8 7
6 5
T2
1 2
3 4
8 7
6 5
C34B
TYING POINT
T7
4
1
3
2
T8
1
2
4
3
T1
1 2 9
3 4
8 7
6 5
C34A
4
3
5
2
1
T9
REAR
TM 263-61

Figure 95. Receiver transformer and electrolytic capacitor terminal designations.

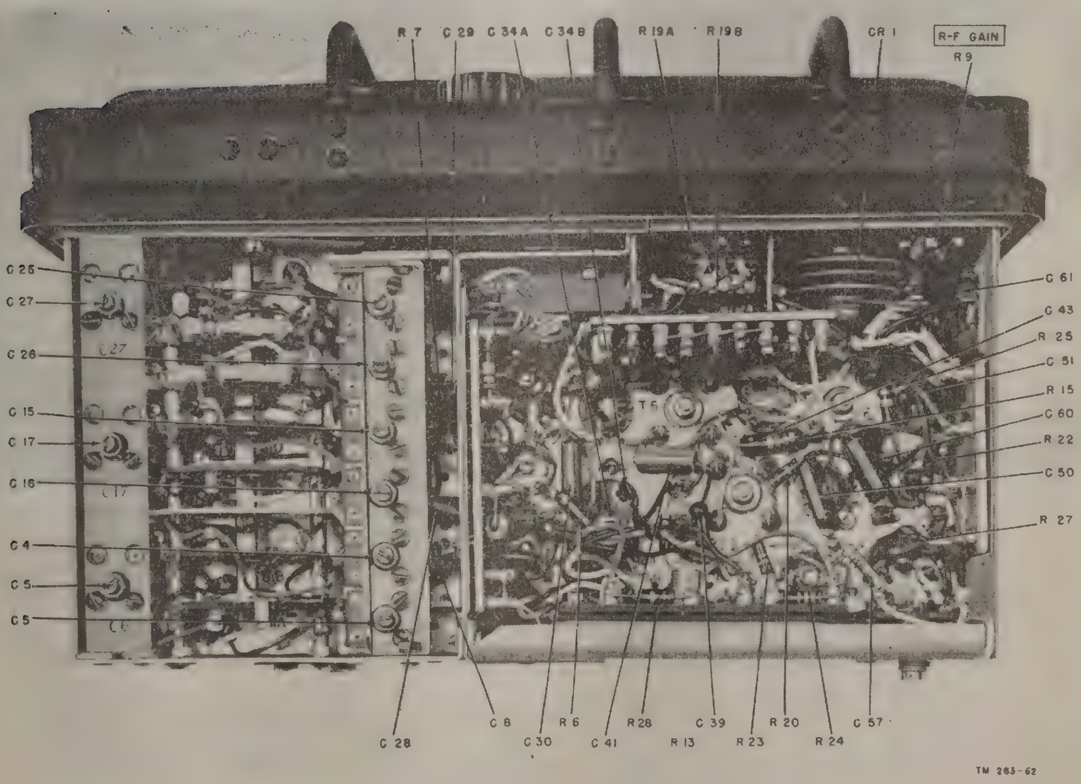

R 7
C 29
C 34A
C 34B
R 19A
R 19B
CR 1
R-F GAIN
R 9
C 25
C 27
C 26
C 15
C 17
C 16
C 4
C 5
C 5
C 61
C 43
R 25
C 51
R 15
C 60
R 22
C 50
R 27
C 28
C 8
C 30
R 6
C 41
R28
R 13
C 39
R 23
R 20
R 24
C 57
TM 263-62

Figure 96. Receiver bottom, parts location.

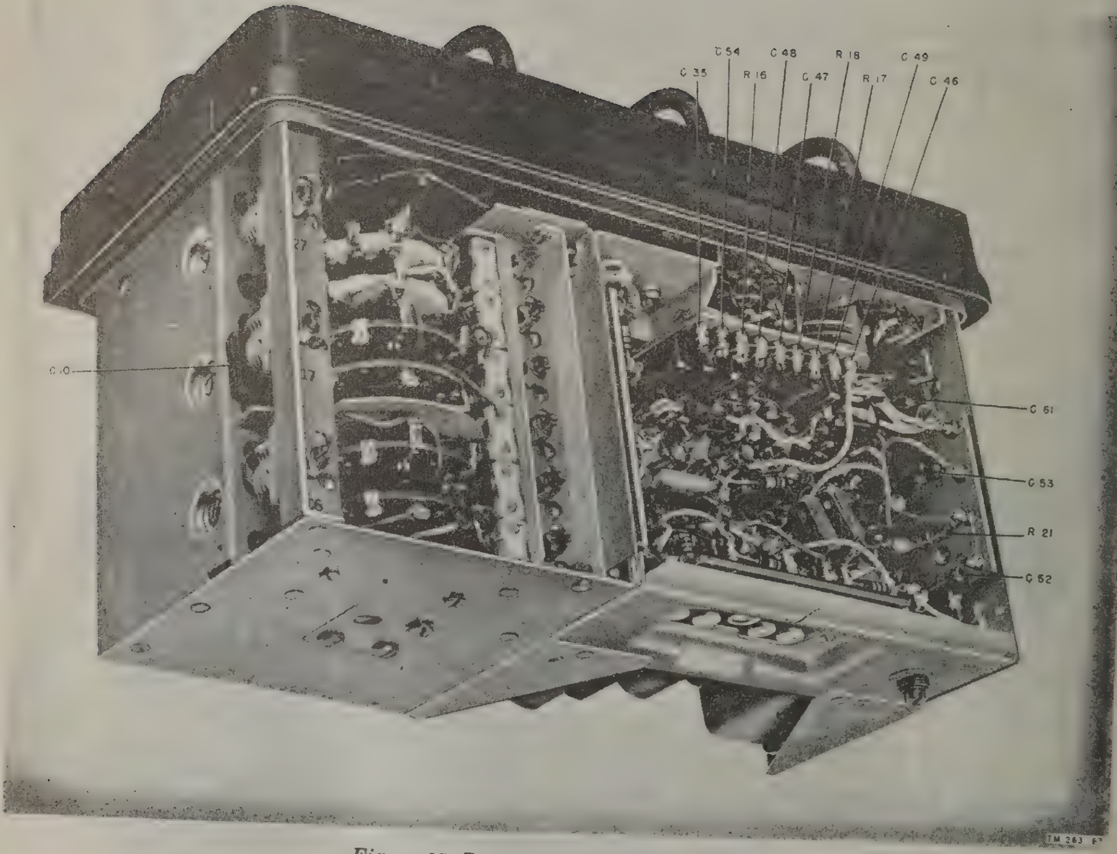

C 35
C 54
R 16
C 48
C 47
R 18
R 17
C 49
C 46
C 60
C 61
C 53
R 21
C 52
TM 263 F

Figure 97. Receiver bottom, parts location.

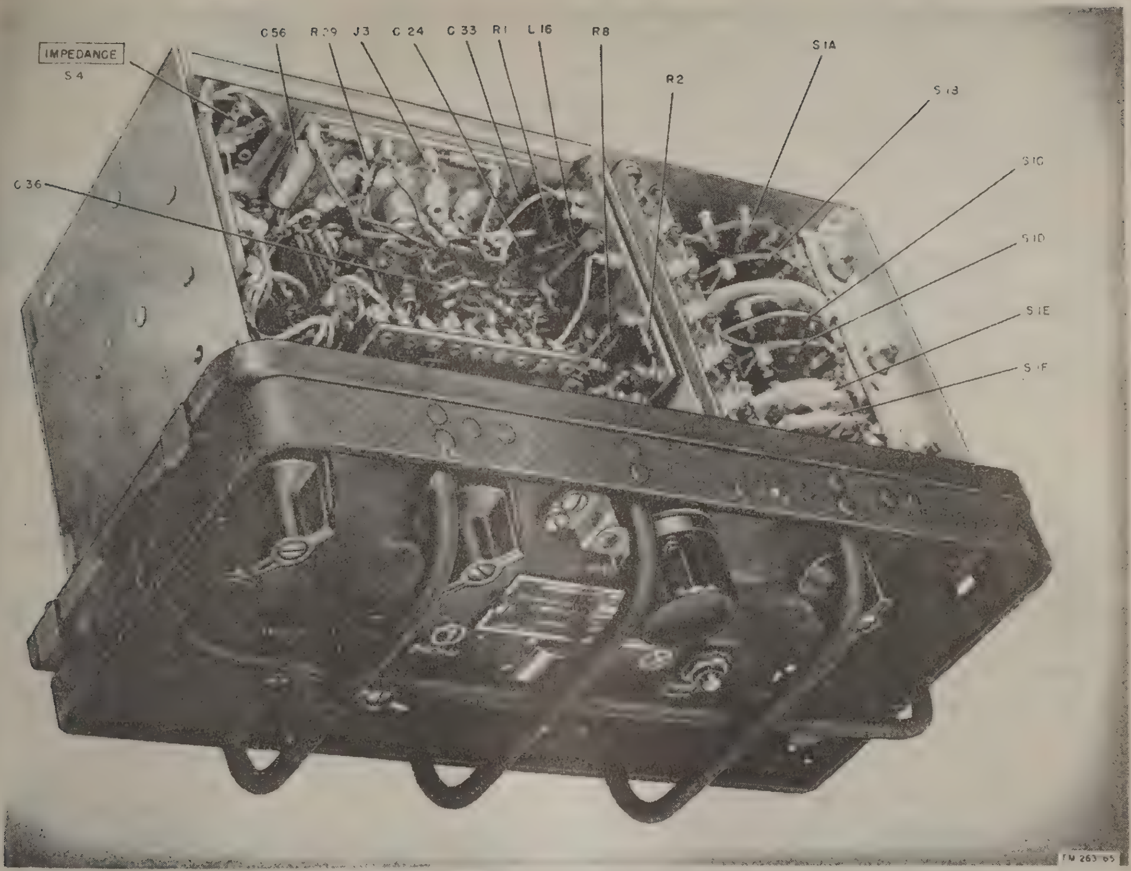


Figure 98. Receiver bottom, parts location.

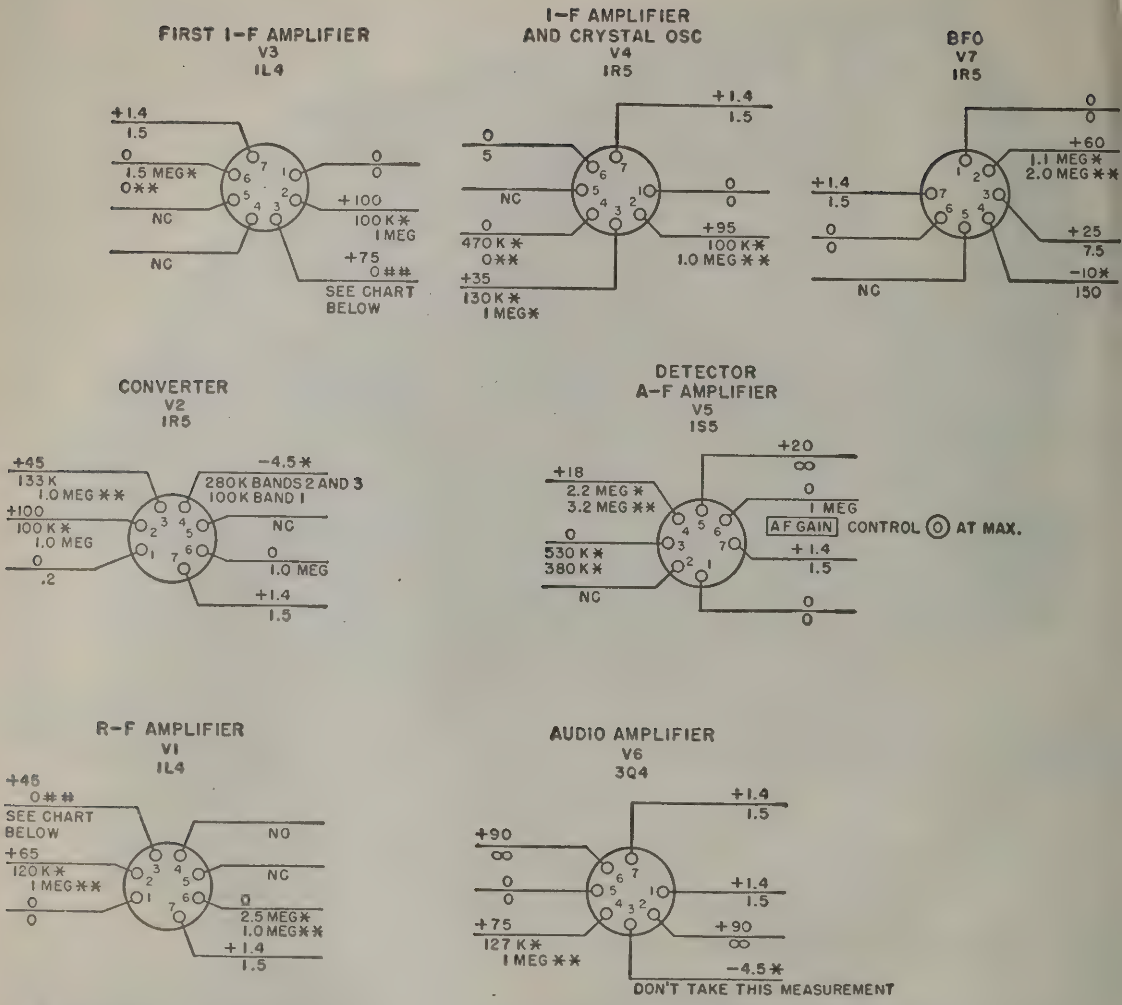
141. Receiver Tube Socket, Voltage and Resistance Diagram

a. The d-c voltages given in figure 99 were made with a 20,000-ohm per volt meter under the following conditions, except as noted on the diagram. Those voltage readings which are marked with an asterisk (*) were made with a VTVM.

(1) Switch Ⓔ (on transmitter) at SEND.
(2) Switch Ⓕ (on transmitter) at BAND 2-MO.
(3) Switch Ⓓ (on transmitter) at CW-HI.
(4) TUNING control Ⓝ on receiver tuned to 5,100 kc.
(5) Control Ⓛ on receiver at C.W.
(6) Switch Ⓜ at BAND 2.
(7) Controls Ⓞ and Ⓟ (A. F. GAIN and R. F. GAIN) at full ON position, except as noted.
(8) All voltages measured to chassis, except as noted.

b. The resistance values were measured with an ohmmeter under the following conditions:

(1) All resistances are measured with tubes in sockets and are measured from tube pin to chassis.
(2) Receiver is disconnected from transmitter.
(3) Phone plug is disconnected from PHONE jack.


FIRST I-F AMPLIFIER
V3
IL4
+1.4
1.5
0
1.5 MEG*
0**
NC
NC
0
0
+100
100 K*
I MEG
+75
0##
SEE CHART BELOW
I-F AMPLIFIER AND CRYSTAL OSC
V4
IR5
+1.4
1.5
0
5
NC
0
470 K*
0**
+35
130 K*
I MEG*
0
0
+95
100 K*
1.0 MEG**
BFO
V7
IR5
0
0
+60
1.1 MEG*
2.0 MEG**
+1.4
1.5
0
0
NC
+25
7.5
-10*
150
CONVERTER
V2
IR5
+45
133 K
1.0 MEG**
+100
100 K*
1.0 MEG
0
.2
-4.5*
280K BANDS 2 AND 3
100K BAND I
NC
0
1.0 MEG
+1.4
1.5
DETECTOR A-F AMPLIFIER
V5
IS5
+18
2.2 MEG*
3.2 MEG**
0
530 K*
380 K*
NC
+20
∞
0
I MEG
AF GAIN CONTROL Ⓞ AT MAX.
+1.4
1.5
0
0
R-F AMPLIFIER
VI
IL4
+45
0##
SEE CHART BELOW
+65
120 K*
I MEG**
0
0
NC
NC
0
2.5 MEG*
1.0 MEG**
+1.4
1.5
AUDIO AMPLIFIER
V6
3Q4
+90
∞
0
0
+75
127 K*
I MEG**
+1.4
1.5
+1.4
1.5
+90
∞
-4.5*
DON'T TAKE THIS MEASUREMENT

RESISTANCE MEASUREMENTS NOTES:

# INDICATES SWITCH Ⓛ IN CAL.
* INDICATES SWITCH Ⓛ IN PHONE POSITION.
** SWITCH Ⓛ IN ALL OTHER POSITIONS.

VOLTAGE MEASUREMENTS NOTES:

INDICATES R-F GAIN CONTROL Ⓟ AT OFF.
NC INDICATES NO CONNECTION.

VI PIN 3 (SCREEN) RESISTANCE TO CHASSIS			V3 PIN 3 (SCREEN) RESISTANCE TO CHASSIS		
SWITCH POSITION	R-F GAIN CONTROL		SWITCH POSITION	R-F GAIN CONTROL	
	MAXIMUM	MINIMUM		MAXIMUM	MINIMUM
PHONE	190 K	100 K	PHONE	120 K	27 K
CW	1.1 MEG	100 K	CW	500K	27 K
NET	1.1 MEG	100 K	NET	5.7 MEG	5.7 MEG
CAL	1.1 MEG	100 K	CAL	500K	27 K

TM 263-58A

Figure 99. Receiver tube socket, voltage and resistance diagram.

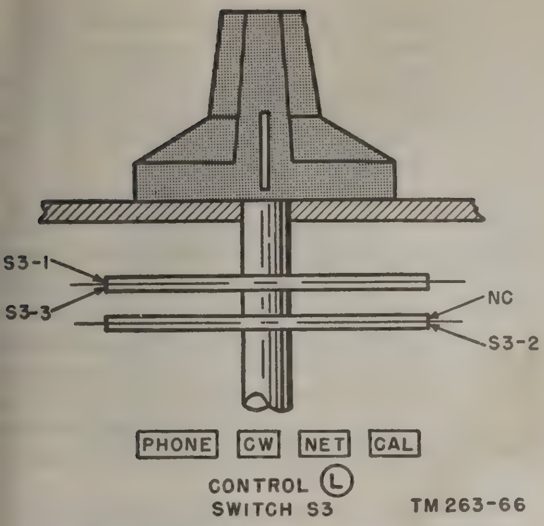


Figure 100. Location of wafer sections of switch S3.

142. D-c Resistances of Transformers and Coils

The d-c resistances of the transformers and coils in the receiver are listed below:

Transformer or coil	Terminals	Ohms
T1	Place test prods into 8-9 on power socket J3 to test all three primary coils of transformer T1.	BAND 1* .5** BAND 2 .5** BAND 3 .5**
	4–GND.	BAND 3* .5**
	3–GND.	BAND 2 .5**
	2–GND.	BAND 1 .5**
T2	5–1	21
	6–1	10
	7–1	1
	4–GND.	BAND 3 .5**
	3–GND.	BAND 2 .5**
	2–GND.	BAND 1 .5**
T3	4–GND.	BAND 3* 220,000
	3–GND.	BAND 2 220,000
	2–GND.	BAND 1 47,000
	5–GND.	BAND 3 .5** Remove tube V2
	6–GND.	BAND 2 .5** Remove tube V2
	7–GND.	BAND 1 .5** Remove tube V2
T4	3–2	5
T5	1–4	5
T6		
T7	3–4	26
	4–2	30,000
T8	1–4	Cannot be checked because capacitor C58 is in series with coil.
T9	2–5	1,200
	1–3	350
	3–4	22
L16		.5** With converter tube V2 removed.

*Turn control Ⓜ to the band indicated for the terminals to be checked.

**Resistance negligible, .5 ohm or less.

143. Signal Substitution Notes

At times the condition arises where the trouble-shooting charts will not disclose the source of trouble in the receiver. For such a situation, the signal substitution or signal tracing method must be used.

a. Signal substitution requires a source of audio, i-f, and r-f signals. Signal Generator I–72–(*) is suitable for this purpose.

b. In addition, a headset or permanent magnet loudspeaker such as Headset HS–30–(*) or Loudspeaker LS-7, respectively, is necessary. In the tests indicated, ground the negative lead of the signal generator to the receiver chassis. For r-f signals, connect the other lead of the signal generator through a 110-uuf capacitator. For i-f signals, use a .05-uf (microfarad) capacitor.

c. Note the volume, and listen for serious distortion from the loudspeaker or headset at the various points in the signal substitution procedure. When working back from the output to the input stages, decrease the output of the signal generator as much as possible. If possible, compare the defective receiver with a receiver known to be in good condition.

d. Check the wiring and soldering in each stage during the procedure.

Caution: Do not remove shield cans from transformers unless the trouble has been traced to a specific unit. Do not damage the wiring by pushing it back and forth during inspection. Be careful not to damage the receiver in any other way.

e. Misalinement of one or more stages of the receiver will cause reduced output. Misalinement of the h-f oscillator may prevent any output.

f. When trouble is localized in a given stage, first test the tube; then measure the voltage; and finally measure the resistance at the tube socket of that stage.

g. Trouble in a circuit or stage may not cause changes in voltage and resistance measurements at the tube socket. The instructions included in this paragraph are merely used as a guide and should suggest other procedures, such as voltage and resistance measurements on individual parts.

h. Remove only *one* tube at a time when testing. Check the number of the tube, and, if it is not defective, return it to its proper socket before another tube is removed.

i. At each step, it is assumed that all previous steps were completed satisfactorily. Isolate and clear any trouble located before proceeding with the succeeding steps.

144. A-f Tests

Place control Ⓒ on PHONE position. For the signal substitution method, use the following procedure:

a. TRANSFORMER T9. Set Signal Generator I–72–(*) to an audio frequency note such as 1,000 cycles, and connect the hot lead through a .05-uf capacitor to terminal 2 of transformer T9. A weak undistorted signal should be heard in the headset. If not, the trouble is isolated to the components making up the output section.

b. AUDIO AMPLIFIER V6. Clip the hot lead through a .05-uf capacitor to pin 3 of tube V6. The signal should be heard with slightly greater intensity in the headset. If no signal or a decidedly weaker signal is heard, then either tube V6 or its associated circuit is defective. Refer to paragraph 140.

c. FIRST AUDIO AMPLIFIER V5.

(1) Place the hot lead through a .05-uf capacitor on pin 5 of tube V5. If tube V6 is found normal, the signal heard should be slightly lower than on pin 3 of tube V6. If the signal is not heard at all, the trouble thus has been traced to the circuit comprised of resistors R21, R19B, capacitors C52, C53, C54, and bias cell BT1. Also, the plate of tube V5 may be shorted to another element in the tube envelope.

(2) Next, clip the hot lead through a .05-uf capacitor to pin 6 of tube V5. A louder signal should be heard in the headset. If not, refer to paragraph 140 for tube V5.

d. DETECTOR SECTION OF TUBE V5. For the net series of tests, the signal generator should be set to 456 kc with 30 percent modulation at 400 cycles. Connect the hot side of the signal generator through a .05-uf capacitor to the diode plate (pin 3) of tube V5. The signal heard should be of approximately the same magnitude as for pin 6 of the same tube. If the signal is not heard at all, the trouble therefore has been isolated to the detector circuits. Refer to paragraph 140.

e. BFO V7. *For checking the bfo only,* all modulation should be removed from the signal generator, and control Ⓒ on the receiver should be set to C.W. position. Clip the hot lead to the diode plate (pin 3) of tube V5. Increase the signal generator output volume until a beat note is heard. If no sound is heard in the phones, the bfo is not operating. Refer to paragraph 140.

145. I-f Tests

a. SECOND I-F AMPLIFIER V4. Place control Ⓒ on PHONE. Restore the modulation to the signal generator. Place the hot lead through a .05-uf capacitor on pin 2 of tube V4. If no signal is heard, transformer T6 is probably defective or out of alinement. Clip the hot lead through a .05-capacitor to the signal grid (pin 6). The signal heard should be loud enough so that the output volume of the signal generator will have to be reduced. If a weak signal or no signal is heard, refer to paragraph 140, tube V4.

b. FIRST I-F AMPLIFIER V3. Repeat the same procedure as for the second i-f amplifier (par. 145*a*). The signal heard should be very loud.

c. CONVERTER TUBE V2.

(1) Connect the hot lead through a .05-uf capacitor to the plate (pin 2) of tube V2. If no signal is heard, transformer T4 may be defective or misalined.

(2) To determine if the oscillator part of the converter stage is at fault, measure the d-c voltage from pin 4 to ground with a VTVM. A reading of about –4 volts indicates that the oscillator section is working.

146. R-f Tests

a. CONVERTER TUBE V2.

(1) Set the signal generator to a frequency of 12 mc, modulated 30 percent at 400 cycles. Turn control Ⓜ to BAND 1. Tune TUNING control Ⓝ to 12 mc. Connect the hot lead through a capacitor of 110-uuf capacity to the signal grid (pin 6) of the converter tube V2. A loud, clear signal should be heard in the headset. If not, either the oscillator section is defective or the h-v supply to the tube has failed. Refer to paragraph 140.

(2) Repeat the above procedure for the highest and lowest frequencies in each wave band.

b. R-F AMPLIFIER.

(1) Clip the hot lead of the signal generator through a 110-uuf capacitor to the plate of the r-f amplifier (pin 2). The signal should come through to the headset with high volume for each of the lowest and highest frequencies in the three bands. If not, transformer T2 probably needs realinement.

(2) Next clip the hot lead through a 110-uuf capacitor to the signal grid (pin 6) of tube V1. If the signal does not come through louder than for any of the other stages, the tube is defective or the supply voltages to the tube are incorrect. Refer to paragraph 140.

c. ANTENNA CIRCUITS (fig. 56)

(1) Connect the hot lead through a 110-uuf capacitor to terminal 8 of receiver receptacle J3. Disconnect the ground lead of the signal generator from the chassis, and reconnect it to terminal 9 of receptacle J3. The signal should come through loudly and clearly for the high and low frequencies of all three bands. If not, transformer T1 is either defective or misalined.

(2) The possibility that the antenna circuit may be defective within the transmitter must not be overlooked. To check this, remove the hot lead from terminal 8 of receptacle J3, and reconnect it to the ANT. binding post on the transmitter. Turn control Ⓓ on the transmitter to PHONE. If the signal does not come through with loud volume, transformer T114, switch S102F, or relay K101 may be defective.

147. Sectionalizing Trouble in the Transmitter Section of Radio Set AN/GRC–9

The transmitter section is constructed as a compact unit that does not lend itself readily to the usual methods used in sectionalizing trouble in the average transmitter. Sectionalization can be done best with a voltohmmeter, since there are no visual indications other than the resonance indicator to determine whether or not the transmitter is functioning properly. A simple test is to set the controls for calibrating the transmitter against the receiver, such as operating as a net station. If the beat note is not heard, and the receiver is known to be perfect, and it is impossible to tune the transmitter to resonance by use of the resonance indicator, the transmitter is probably defective. Remove the transmitter by unfastening the four catches and the connecting cable and pulling the unit straight out of the case. Check all the tubes, preferably by replacing them with others. After it has been determined that the tubes are satisfactory, check the voltages at the metering socket with a voltmeter to determine whether they are in conformance with the metering socket voltage chart on the back of the transmitter chassis. A reproduction of the chart is shown below. If any of the voltages are abnormal, refer to the sectionalization and localization charts.

Caution: Be very careful not to touch the plate cap of power amplifier tube V103 (2E22). It carries a potential of 500 volts to ground *at all times.*

Metering Socket Voltages P. A.—High Power

Term.	Term.	Voltage	Measurement
2+	8—	.10	PLATE CURRENT-NO LOAD-PHONE*
3+	7—	180	SCREEN GRID—PHONE
4—	7+	40	SUPPRESSOR GRID BIAS-PHONE
5—	7+	60	GRID BIAS
6+	7—	105	MO.-MOD.-REC. PLATE VOLTAGE
8+	7—	500	PLATE VOLTAGE
1+	7—	6.3	FIL. VOLTAGE

*Meter leads dangerous when power is on. Current in M.A. = volt. x 50.

147. Sectionalizing Trouble in Transmitter Section of Radio Set AN/GRC–9

Symptom	Probable trouble	Correction
1. Transmitter inoperative. No voltage between 1 and 7 at metering socket. Control Ⓓ on CW key down. All other metering socket voltages are normal.	1*a*. Capacitor C132 shorted	1. See figure 80. *a*. Replace capacitor C132.
	b. Capacitor C115 shorted	*b*. Replace capacitor C115.
2. No voltage between 6 and 7 of metering socket.	2*a*. Switch S103D defective or dirty	2. See figure 81. *a*. Repair and clean switch S103D.
	b. Tube V104 defective	*b*. Replace tube V104.
	c. Capacitor C134 shorted	*c*. Replace capacitor C134.
	d. Capacitor C138 shorted	*d*. Replace capacitor C138.
3. No voltage between 8 and 7 of metering socket.	3*a*. Keying relay K101 contacts 7 and 8 are shorted together.	3*a*. Remove short and clean contacts.
	b. If there is no voltage for only one or two bands, any of capacitors C118, C119, or C120 may be shorted. If on all bands, either capacitor C101C or capacitor C121 is shorted.	*b*. Inspect capacitors and remove short. Replace capacitor C121.
4. Beat note not heard when receiver-transmitter is set up for net operation. Metering socket voltages are normal.	4. MO or DOUBLER stage not operating.	4. Refer to paragraph 147.
5. Beat note heard when receiver-transmitter is set up for net operation.	5. Check metering socket voltage between 2 and 8. If an incorrect reading is obtained, the POWER AMPLIFIER stage is faulty.	5. Refer to paragraph 147.
6. Signal is radiated, but without modulation on PHONE and MCW positions of control Ⓓ.	6*a*. Modulator tube V105 defective	6*a*. Replace tube.
	b. Incorrect voltages on modulator tube elements.	*b*. See paragraph 148 (modulator).
	c. Suppressor grid of power amplifier V103 incorrectly biased.	*c*. See paragraph 148 (symptom 14).
	d. MODULATOR stage circuit defective.	*d*. See paragraph 148 (modulator).

148. Localizing Trouble in Transmitter Section of Radio Set AN/GRC–9

Because of the compactness of the transmitter, it may be difficult to localize trouble without first removing the main tuning capacitor C101. This tuning capacitor is a complete plug-in unit and can be removed as follows:

a. Refer to figure 101. Remove the dial lockscrews and dial knob from the main tuning capacitor shaft on the front panel of the transmitter. On some transmitter models, the dial knob is held to the shaft by a small setscrew which can be loosened with the larger Bristo wrench contained in Box BX–53–C.

b. With a screw driver, remove all screws marked "A" and "B" on the bottom of the transmitter assembly, and remove the cover plate held on by these screws (fig. 102).

c. Swing up the hinged back panel of the transmitter to allow exposure of the main tuning capacitor as in figure 103.

d. Remove the spade lug on the side of the tuning capacitor shown in figure 103.

e. Following this step, remove the three capacitor retaining screws on the front panel of the transmitter seen in figure 101.

f. Again, from the rear of the transmitter, gently rock the entire capacitor assembly toward and away from the back of the front panel, lifting it outward at the same time.

Caution: Any variation in the plates that might occur from the removal will seriously affect the calibration of the transmitter.

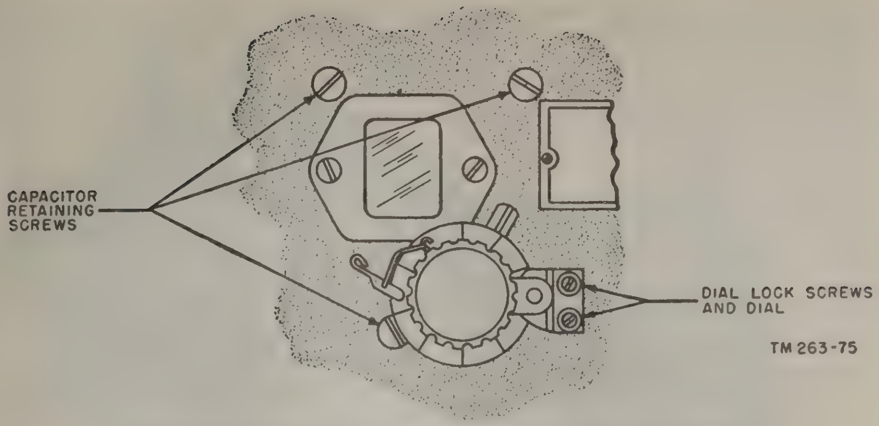

CAPACITOR RETAINING SCREWS
DIAL LOCK SCREWS AND DIAL
TM 263-75

Figure 101. Transmitter capacitor and dial retaining screws.

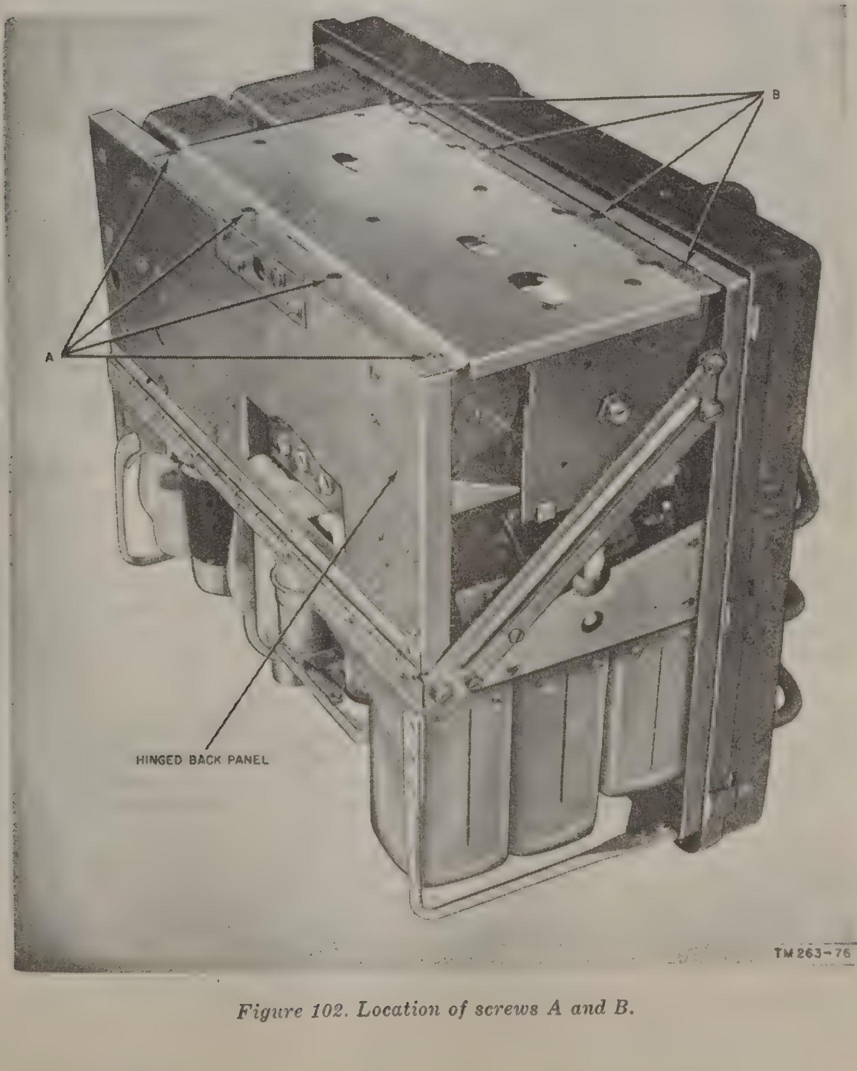

B
A
HINGED BACK PANEL
TM 263-76

Figure 102. Location of screws A and B.

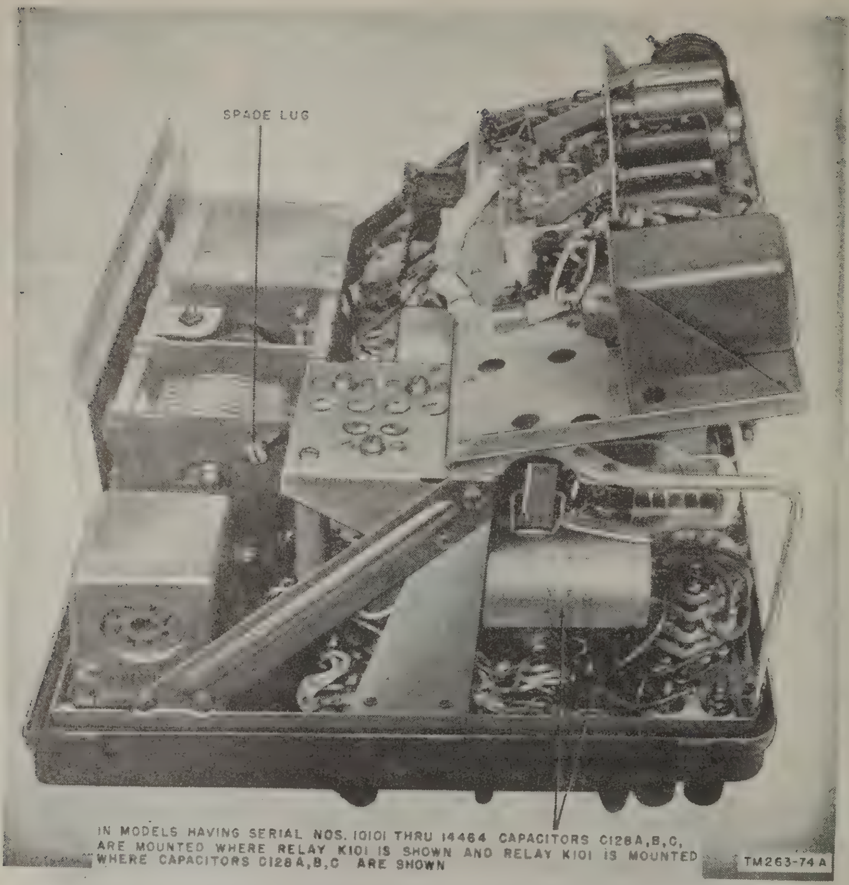

SPADE LUG
IN MODELS HAVING SERIAL NOS. 10101 THRU 14464 CAPACITORS C128A,B,C, ARE MOUNTED WHERE RELAY K101 IS SHOWN AND RELAY K101 IS MOUNTED WHERE CAPACITORS C128A,B,C ARE SHOWN
TM263-74A

Figure 103. Back panel of transmitter shown swung up to expose tuning capacitor.

148. Localizing Trouble in Transmitter Section of Radio Set AN/GRC–9—*Continued*

Symptom	Probable trouble	Correction
MASTER OSC 3A4 (V101):		
1. Master oscillator does not oscillate on either MO or XTAL position. All d-c supply voltages are normal.	1*a*. Faulty tube V101	1*a*. Replace tube V101.
	b. Grid coil between terminals 4 and 5 of transformer T101 is open.	*b*. Check resistance between 4 and 5. Replace transformer T101.
	c. One of capacitors C146, C101A, C102, C129, and C106B may be shorted.	*c*. Check resistance between terminals 1 and 3 of transformer T101.
	d. Grid resistor R102 is open	*d*. Replace resistor R102.
	e. Capacitor C105 may be open	*e*. Momentarily, short capacitor C105 with one of equal capacity.
	f. Capacitor C103 may be open	*f*. Momentarily, short capacitor C103 with one of equal capacity.
	g. Capacitor C104 may be open	*g*. Momentarily, short capacitor C104 with one of equal capacity.
2. Oscillator does not oscillate on XTAL position only. All d-c supply voltages are normal.	2*a*. If oscillator does not oscillate for only one or two crystals, they are probably defective or switches S101D and S101E are dirty or open.	2*a*. Replace the crystals. Clean or replace the switch sections.

48. Localizing Trouble in Transmitter Section of Radio Set AN/GRC-9—Continued

Symptom	Probable trouble	Correction
	b. Capacitor C103 shorted	*b.* Replace capacitor C103.
	c. Oscillator plate coil in transformer T101 mistuned.	*c.* Refer to paragraph 170 on alinement.
. Incorrect d-c voltage on pin 3. All other voltages are normal.	3*a.* Resistor R101 open *b.* Capacitor C103 may be shorted	3*a.* Check resistor, replace if defective. *b.* Replace defective capacitor.
. Incorrect d-c voltage on pin 2 or 6. All other voltages are normal.	4*a.* Open plate coil for one or two bands.	4*a.* Replace faulty transformer.
	b. Switch S101A open or dirty	*b.* Clean or replace switch S101A.
	c. Partially short one of capacitors C146, C101A, C129, and C106.	*c.* Replace shorted capacitor.
. No voltage on pin 7	5*a.* Resistor R110 open *b.* Shorted regulator CR101	5*a.* Replace resistor R110. *b.* Replace regulator CR101.
OUBLER 3A4 (V102):		
6. DOUBLER stage does not pass oscillator signal. D-c supply voltages to tube are normal.	6*a.* Capacitor C109 or C110 open	6*a.* Momentarily, short capacitor C109 or C110 with one of equal capacity.
	b. Doubler coil T104A, T104B, or T104C misalined.	*b.* See paragraph 170 on alinement.
	c. Resistor R104 open	*c.* Replace resistor R104.
	d. Switch S101G or S101I open or dirty.	*d.* Clean or replace switches.
7. Incorrect d-c supply voltage on pin 2 or 6.	7*a.* Choke coil L101 open *b.* Resistor R105 open *c.* Relay K101 contacts 9 and 10 defective.	7*a.* Replace choke L101. *b.* Replace resistor R105. *c.* Check and clean contacts.
8. Incorrect d-c supply voltage on pin 3. All other voltages are normal.	8*a.* Resistor R120 open *b.* Capacitor C142 shorted *c.* Resistor R121 open	8*a.* Replace resistor R120. *b.* Replace capacitor C142. *c.* Replace resistor R121.
9. Incorrect voltage on pin 7	9. Resistor R110 open	9. Replace resistor R110.
POWER AMPLIFIER 2E22, V103:		
10. Power amplifier does not pass signal. Tube d-c supply voltages are normal.	10*a.* Switch S101J or S101L open	10*a.* Check switches and clean contacts.
	b. Open circuit in one of p-a coils T104A, B, and C.	*b.* Check continuity of the three p-a coils.
	c. P-a coils T107, T108, and T109 may be misalined.	*c.* Refer to paragraph 170 on alinement.
	d. Plate cap connection may be faulty.	*d.* Repair plate cap connection.
11. Excessive plate current, as indicated by abnormal voltage at terminals 2 and 8 on metering socket.	11*a.* Antenna circuits or coils T107, T108, and T109 are misalined.	11*a.* Refer to paragraph 170 on alinement.
	b. Insufficient d-c grid bias. Check terminals 5 and 7 of metering socket. If voltage is too low, resistors R106, R107, or relay coil K102A is open.	*b.* Replace defective component.
12. Excessive signal grid current, as evidenced by abnormally high voltage from 5 to 7 on the metering socket.	12*a.* Screen grid supply voltage too low. Check voltage between 3 and 7 of metering socket on PHONE position of control ⓓ. If an abnormal reading is obtained, check resistors R124, R117, and R118. Capacitor C116 may be shorted.	12*a.* Replace defective components.
	b. Plate supply voltage may be too low. Check variable tuning capacitor C101C for leakage. Capacitor C121 may be leaking.	*b.* Clean capacitor C101C. Replace capacitor C121.
	c. Overload relay K102 contacts open.	*c.* Refer to symptom 28 of this chart.

148. Localizing Trouble in Transmitter Section of Radio Set AN/GRC-9—*Continued*

Symptom	Probable trouble	Correction
13. Improper suppressor grid bias, as evidenced by voltage reading from pins 7 to 4 on metering socket, on PHONE and MCW.	13*a*. Incorrect signal grid current. The suppressor grid receives its d-c bias from across relay coil K102A and resistor R107.	13*a*. See symptom 13 above.
	b. Capacitor C117 may be shorted	*b*. Replace capacitor C117.
14. Incorrect voltage from plate cap of tube to ground. *Caution:* There are 500 volts to ground on the plate cap of tube V103 (2E22).	14*a*. Resistor R108 open	14*a*. Replace resistor R108.
	b. Capacitor C121 shorted	*b*. Replace capacitor C121.
	c. One of coils T107, T108, and T109 may be open.	*c*. Check resistance of the coils.
15. Incorrect d-c supply voltage on pin 1 of tube.	15*a*. If the condition is only at PHONE, contacts 14 and 15 of relay K101 are defective.	15*a*. Clean contacts of relay K101.
	b. Switch S105–3 is open or dirty	*b*. Repair switch S105–3.
	c. Capacitor C115 is shorted	*c*. Replace capacitor C115.
MODULATOR 3A4 (V105):		
16. No modulator voltage output. Tube d-c supply voltages are normal. No sidetone signal.	16*a*. Resistor R111 or R112 open	16*a*. Check resistor R111 or R112.
	b. Open circuit in primary or secondary of transformer T112.	*b*. Check for continuity of transformer T112.
	c. Defective tube V105	*c*. Replace tube V105.
	d. Jack J104 defective	*d*. Repair and clean the jack.
17. Modulator inoperative on MCW position only of control Ⓓ. Tube d-c supply voltages are normal.	17*a*. Capacitor C143 defective	17*a*. Replace capacitor C136.
	b. Defective tube V105	*b*. Replace tube V105.
18. No sidetone signal sent to receiver. Otherwise, modulator operates normally.	18. Potentiometer R115 (control Ⓖ) open or dirty.	18. Replace potentiometer R115.
19. Incorrect d-c supply voltage on pin 3.	19*a*. Resistor R113 open	19*a*. Replace resistor R113.
	b. Capacitor C137 shorted	*b*. Replace capacitor C137.
	c. Switch S3–3 in *receiver* is defective.	*c*. Inspect and repair switch S3–3.
20. Incorrect d-c supply voltage on pins 2 and 6.	20*a*. Transformer T113 open between terminals 3 and 4. Choke coil L103 open.	20*a*. Check for continuity.
	b. Capacitor C138 shorted. Capacitor C143 shorted.	*b*. Replace defective components.
	c. Relay K101 contacts 17 and 18 are defective.	*c*. Repair and clean the contacts.
21. Incorrect d-c supply voltage on pin 7.	21. Resistor R110 open	21. Check resistor R110.
KEYING RELAY K101:	See figure 79.	
22. Relay does not operate when key is depressed.	22*a*. Relay coil is open	22*a*. Disconnect one end of resistor R125 and test for continuity through coil of relay K101.
	b. Switch S101N defective	*b*. Inspect and clean switch S101N.
	c. Capacitor C133 shorted	*c*. Replace capacitor C133.
23. Relay, contacts chatter	23*a*. Contacts do not close in the proper sequence.	23*a*. Refer to section V of chapter 6.
	b. Contacts defective	*b*. Refer to section V of chapter 6.
ANTENNA SWITCHING AND TUNING CIRCUITS:	Refer to figure 76.	
24. No signal fed to antenna	24. All continuity checks for each position of control Ⓐ can be made with the aid of figure 76.	24. Replace or repair defective component.

148. Localizing Trouble in Transmitter Section of Radio Set AN/GRC–9—*Continued*

Symptom	Portable trouble	Correction
25. INDICATOR neon bulb will not light. Signal is known to be radiated.	25*a*. Resistor R122 or R123 open	25*a*. Check resistance and replace faulty unit.
	b. Coil L104 open	*b*. Check resistance of coil L104.
	c. Defective neon indicator I101	*c*. Replace neon indicator.
OVERLOAD RELAY K102:		
26. Overload relay fails to open	26. Contacts jammed or bent	26. Replace relay K102.
7. Overload relay fails to close	27. Coil K102A open	27. Disconnect the lead from pin 1, and check resistance between terminals 1 and 2.
28. Relay chatters	28*a*. Contacts 15 and 16 of keying relay K101 are defective.	28*a*. Clean and repair the contacts.
	b. Overload relay coil K102B is open	*b*. Turn control Ⓔ to OFF. Turn control Ⓓ to PHONE. Check resistance between pin 3 and ground. It should be 67 ohms; if not, coil K102B is open.

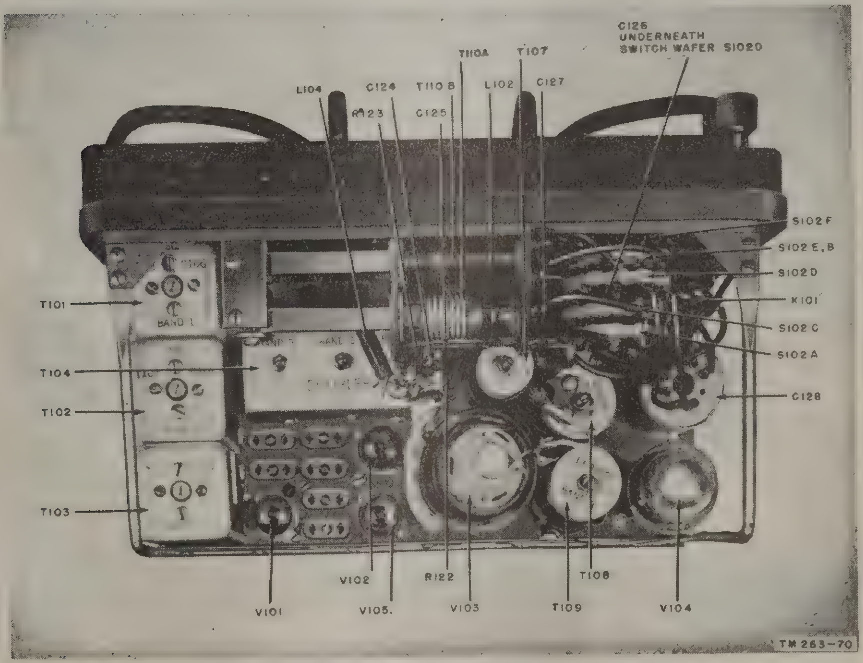
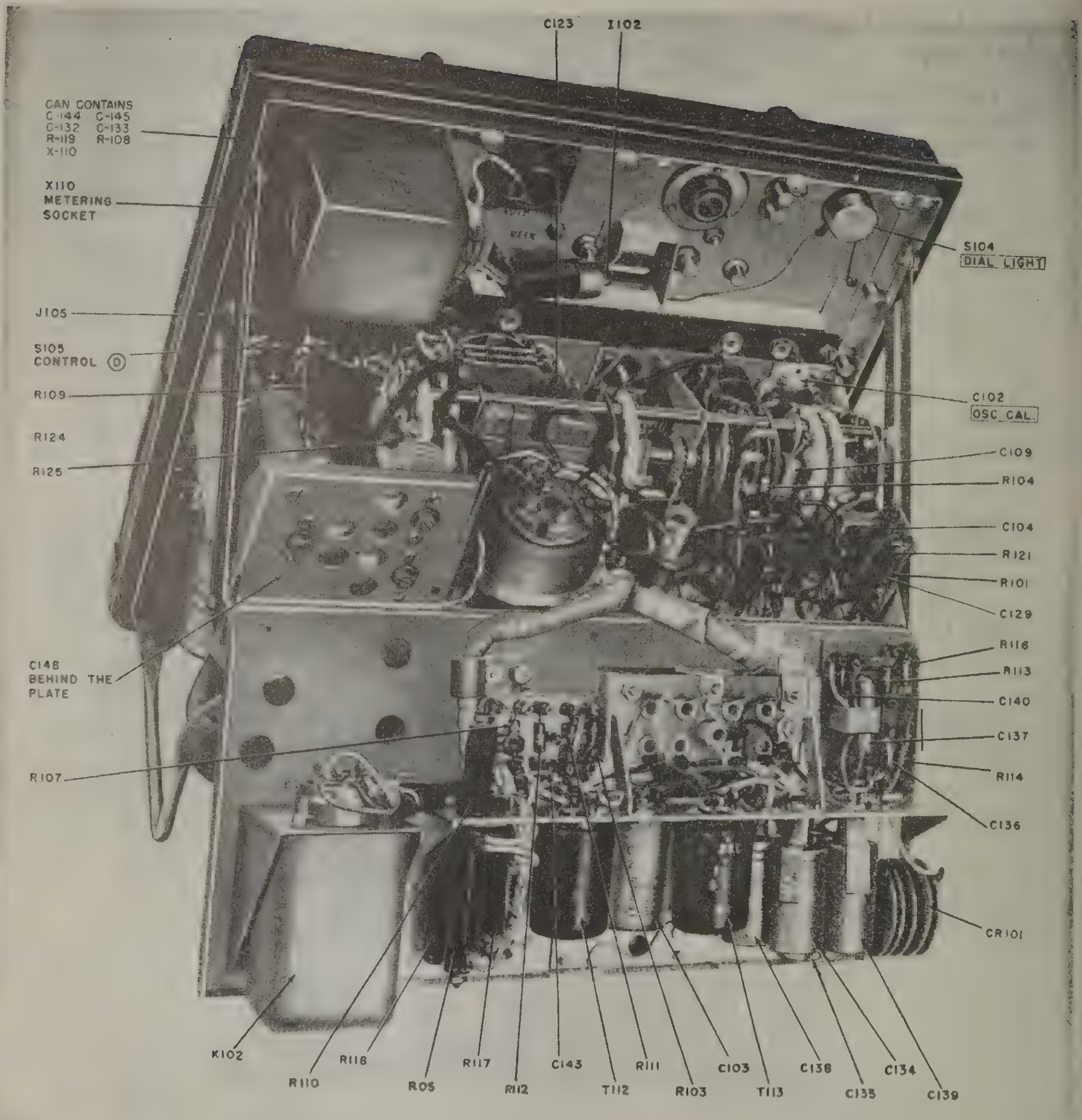

C126 UNDERNEATH SWITCH WAFER S102D
T110A
T107
L104
C124
T110 B
L102
C127
R123
C125
S102 F
S102 E,B
S102 D
K101
S102 C
S102 A
C128
T101
T104
T102
T103
V102
R122
T108
V101
V105.
V103
T109
V104
TM 263-70

Figure 104. Transmitter parts location (top).

921610°—51——10


C123
I102
CAN CONTAINS
C-144 C-145
C-132 C-133
R-119 R-108
X-110
X110
METERING
SOCKET
S104
DIAL LIGHT
J105
S105
CONTROL (D)
R109
C102
OSC CAL.
R124
C109
R125
R104
C104
R121
R101
C129
R116
R113
C148
BEHIND THE
PLATE
C140
C137
R107
R114
C136
CR101
K102
R118
R117
C143
R111
C103
C138
C134
R110
R05
R112
T112
R103
T113
C135
C139

NOTE:
VARIABLE TUNING CAPACITOR C101A,B,C HAS BEEN REMOVED.

TM 263-71

Figure 105. Transmitter parts location (bottom).

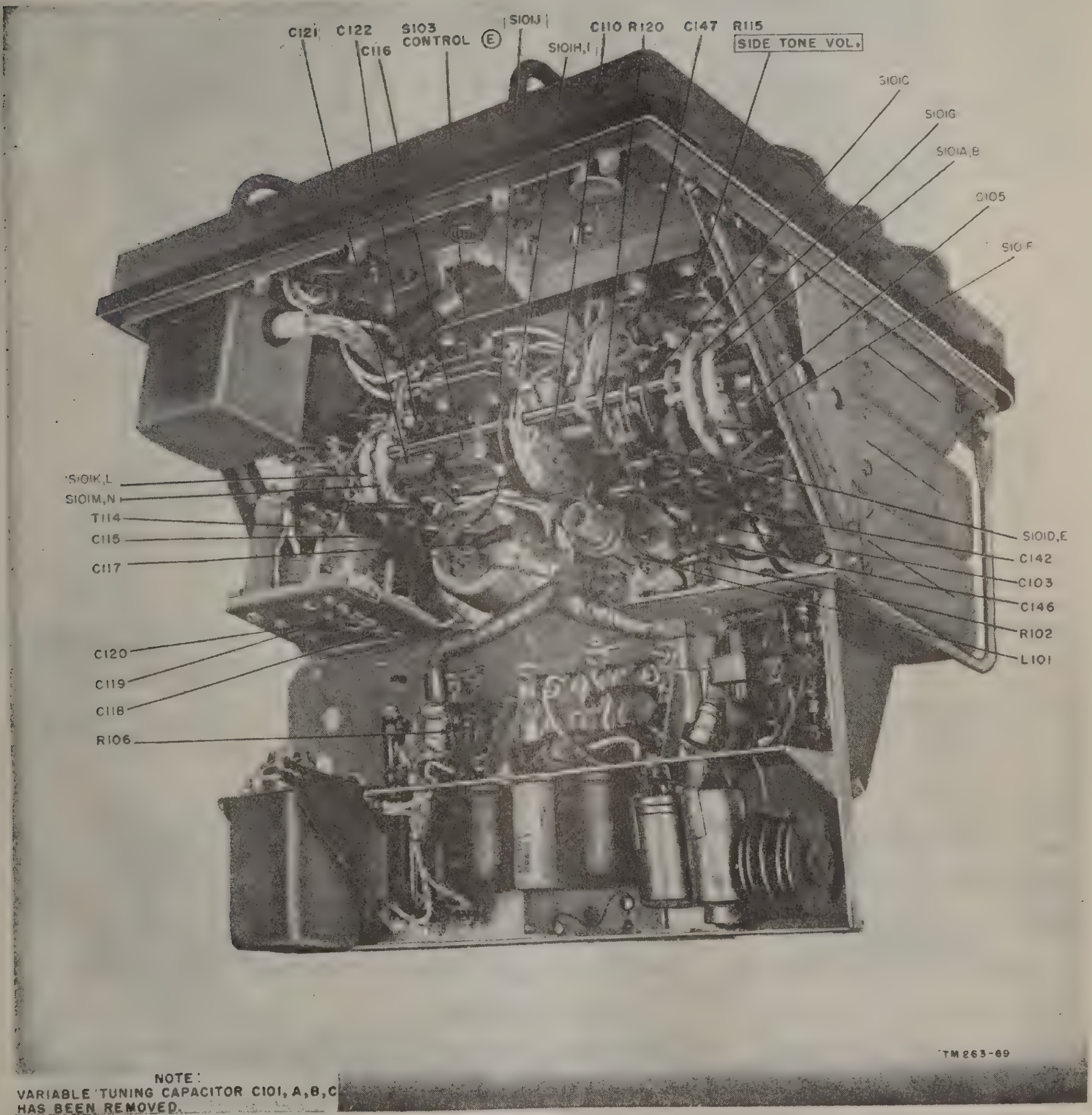
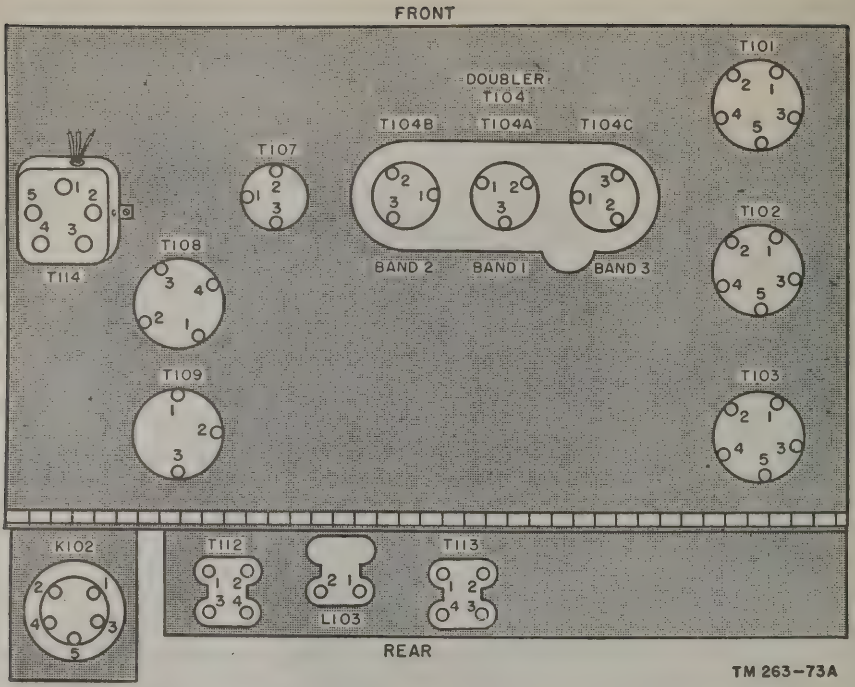
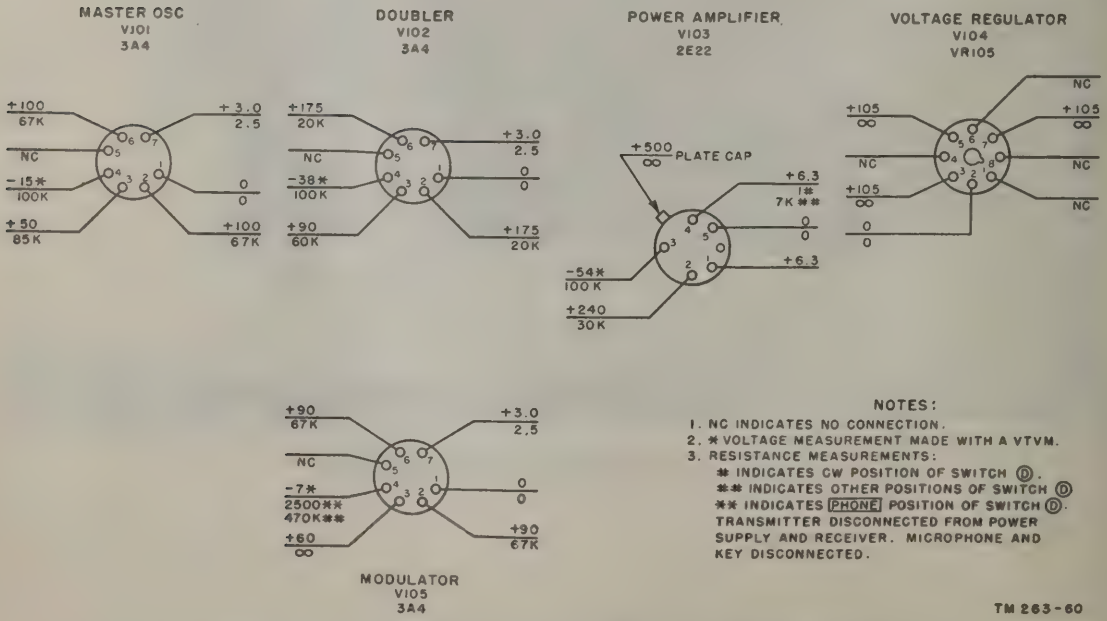

C121
C122
C116
S103
CONTROL Ⓔ
S101J
S101H,I
C110
R120
C147
R115
SIDE TONE VOL.
S101C
S101G
S101A,B
C105
S101F
S101K,L
S101M,N
T114
C115
C117
S101D,E
C142
C103
C146
R102
L101
C120
C119
C118
R106
TM 263-69
NOTE:
VARIABLE TUNING CAPACITOR C101, A,B,C
HAS BEEN REMOVED.

Figure 106. Transmitter parts location (bottom).


FRONT
DOUBLER
T104
T101
T104B
T104A
T104C
T107
T114
T108
BAND 2
BAND 1
BAND 3
T102
T109
T103
K102
T112
T113
L103
REAR
1
2
3
4
5

TM 263-73A

Figure 107. Transformer pin designation on transmitter.


MASTER OSC
VJ01
3A4
+100
67K
NC
-15*
100K
+50
85K
+3.0
2.5
0
0
+100
67K
DOUBLER
V102
3A4
+175
20K
NC
-38*
100K
+90
60K
+3.0
2.5
0
0
+175
20K
POWER AMPLIFIER
V103
2E22
+500
∞
PLATE CAP
+6.3
1*
7K **
0
0
+6.3
-54*
100 K
+240
30K
VOLTAGE REGULATOR
V104
VR105
NC
+105
∞
+105
∞
NC
NC
+105
∞
NC
0
0
+90
67K
NC
-7*
2500**
470K**
+60
∞
+3.0
2.5
0
0
+90
67K
MODULATOR
V105
3A4

NOTES:
1. NC INDICATES NO CONNECTION.
2. * VOLTAGE MEASUREMENT MADE WITH A VTVM.
3. RESISTANCE MEASUREMENTS:
* INDICATES CW POSITION OF SWITCH Ⓓ.
** INDICATES OTHER POSITIONS OF SWITCH Ⓓ
** INDICATES PHONE POSITION OF SWITCH Ⓓ.
TRANSMITTER DISCONNECTED FROM POWER SUPPLY AND RECEIVER. MICROPHONE AND KEY DISCONNECTED.

TM 263-60

Figure 108. Transmitter tube socket voltage and resistance diagram.

149. Transmitter Tube Socket, Voltage, and Resistance Diagram

(fig. 108)

The d-c voltage values given in the following diagram were made with a 20,000-ohm per volt meter, except those readings marked with an asterisk (*) which are measured with a VTVM. The following control settings were used:

a. Control Ⓕ at BAND 2-MO.

b. Control Ⓓ at CW-HI.

c. Control Ⓔ at SEND.

d. Supply voltage 500 and 105 volts to the plates and screen grids, and 6.3 volts to the filaments.

e. Control Ⓐ, at WHIP position, is tuned to the antenna being used. The resistance values given in the diagram were measured under the same switch conditions as the voltage charts except that the transmitter was disconnected from the receiver and *power supply*, and the MIKE and KEY were disconnected. Variations in switch positions are given in the chart at the bottom of figure 99.

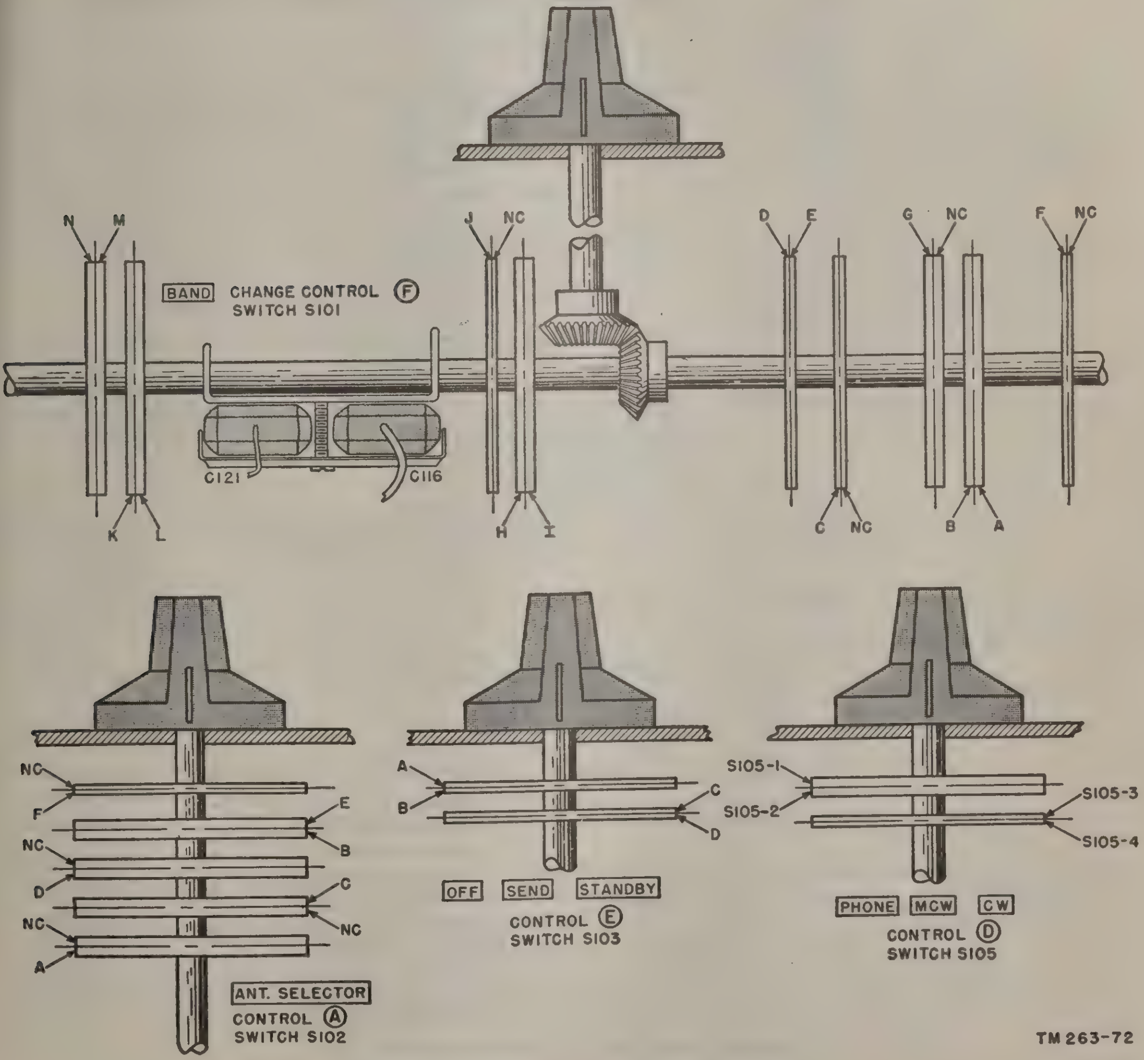

N
M
BAND CHANGE CONTROL Ⓕ
SWITCH S101
C121
C116
K
L
J
NC
H
I
D
E
C
NC
G
NC
B
A
F
NC
NC
F
E
B
NC
D
C
NC
NC
A
ANT. SELECTOR
CONTROL Ⓐ
SWITCH S102
A
B
C
D
OFF
SEND
STANDBY
CONTROL Ⓔ
SWITCH S103
S105-1
S105-2
S105-3
S105-4
PHONE
MCW
CW
CONTROL Ⓓ
SWITCH S105
TM 263-72

Figure 109. Transmitter wafer switch sections.

150. D-c Resistance of Transmitter Coils and Transformers

In order to measure the resistance between several of the contacts listed, first it will be necessary to perform the steps given in the column headed *Condition*. If these steps are not performed before the reading is taken, the value found will be in error.

Transformer or coil	Terminals	Ohms	Condition
T101	1–3	.5 or less	Control Ⓕ in BAND 1 position.
	4–5	.5 or less	
T102	1–3	.5 or less	Control Ⓕ in BAND 2 position.
	4–5	.5 or less	
T103	1–3	2.0 or less	Control Ⓕ in BAND 3 position.
	4–5	.5 or less	
T104A BAND 1	1–3	.5 or less	Control Ⓕ in BAND 1 position.
T104B BAND 2	1–3	.5 or less	Control Ⓕ in BAND 2 position.
T104C BAND 3	1–3	.5 or less	Control Ⓕ in BAND 3 position.
T107	1–3	.5 or less	Control Ⓕ in BAND 1 position.
T108	1–2	.5 or less	Control Ⓕ in BAND 2 position.
	3–4	.5 or less	Control Ⓕ in BAND 2 position.
T109	1–2	.5 or less	Control Ⓕ in BAND 3 position.
	3–2	.5 or less	Control Ⓕ in BAND 3 position.
T110A	1–2	.5 or less	
	3–4	.5 or less	
	1–3	.5 or less	
	5–6	.5 or less	
	6–7	.5 or less	
	5–8	.5 or less	
T112	1–2	30	Remove microphone plug from MIKE jack.
	3–4	1,100	
T113	1–2	725	Unsolder all leads to terminal 1.
	3–4	425	
T114	1–5	.5 or less	Control Ⓐ turned to position 11.
	3–4	2.0	
L101	----------	10	
L102	1–2	.5 or less	
L103	1–2	600	
L104	----------	1.0	
K101	----------	11	Disconnect the lead to one of the K101 coil terminals.
K102A	1–2	5,400	Disconnect the lead to terminal 1 of relay K102.
K102B	3-chassis	67	Control Ⓔ at OFF position. Control Ⓓ at PHONE position.

151. Sectionalizing Trouble in Generator GN–58–(*)

In order to test the generator under load conditions, it will be necessary to remove the top part of the housing. To accomplish this, remove the cover clamp lockscrews which fasten the cover clamps to the side of the housing. After opening the cover clamps, the top of the housing should come off easily when lifted straight up. Figure 110 shows the generator with the cover removed. Next, loosen the screw which holds the terminal strip insulating cover in front of panel board 239. This will expose the terminal board, and all voltage measurements can be made at full load, using the contacts on the board. The measurements are from each terminal to ground.

Caution: Some of the voltages in the generator are of the order of 500 volts. Do not touch any of the exposed terminals or other connections with both hands. Keep one hand completely away from the generator.

151. Sectionalizing Trouble in Hand Generator GN–58–(*)

Symptom	Probable trouble	Correction
1. Incorrect voltages from terminals 32 and 21 to terminal 24. All other voltages are normal. ***Caution:*** There are 500 volts across these two terminals.	1*a*. Brushes on h-v armature are worn, and springs have lost their tension.	1*a*. Check brushes and springs. Replace defective components. Be sure to fit new brushes (par. 152).
	b. Choke coil 228–1 open	*b*. Remove the brush to which coil 228–1 is connected and check the resistance of the coil.
	c. Capacitor 233–1 or 233–2 shorted	*c*. Further disassembly of generator is necessary. See paragraph 152.
	d. Choke coil 228–2 open	*d*. Further disassembly is necessary. See paragraph 152.
2. Incorrect voltage from terminals 21 through 24. Other voltages are normal.	2. Resistor 229 open	2. Check resistance of resistor 229.
3. Incorrect voltage between terminals 20 and 24.	3. Check the h-v circuits (symptoms 1 and 2 above). If they check normal, then the l-v circuit is defective, and further disassembly is necessary.	3. Refer to paragraph 152.
4. Incorrect voltage between terminals 23 and 24. All other voltages are normal.	4. Choke coil 225 open	4. Refer to paragraph 152.
5. No voltage output from any of the terminals.	5*a*. Field coil 237–2 or 237–1 open	5*a*. Remove voltage regulator and then check for continuity of field coils. Further disassembly is necessary.
	b. Voltage regulator is defective	*b*. See paragraph 152.
	c. Resistor 245 open	*c*. Check resistance of resistor 245.
	d. Resistor plaques 1 and 2 may be open.	*d*. See paragraph 152.
6. Voltage output varies within wide limits.	Voltage regulator defective	See paragraph 152.

152. Disassembly of Hand Generator

To determine which component in the hand generator is at fault, it may be necessary to remove the generator and chassis from the bottom half of the housing. The procedure is as follows:

a. Remove the crank handles and take the generator off its leg supports.

b. Remove the seven screws located around the flange of the right crankshaft coupling housing (fig. 111).

c. Insert the tip of an old worn screw driver between Generator GN–58–(*) housing and the coupling housing flange. Pry the assembly away from the housing.

d. Pull the crankshaft coupling through the hole in the housing.

e. Remove the six screws around the flange of the left crankshaft coupling housing.

f. Repeat step *c* above.

g. The hole in the housing is not large enough for the left crankshaft coupling to be passed through it and out of the housing.

h. Remove the terminal strip insulating cover, shown in figure 110, from in front of panel board 239, exposing the spade lug connections on the board.

i. Loosen the screws and remove the spade lugs completely from the board. Make a written note on the color coding of the wires connected to the terminals so that correct reconnection can be effected.

j. Next remove the seven *chassis retaining screws* around the top of the lower half of the housing (fig. 110).

k. Again, with the screw dirver, pry the chassis away from the sides of the housing. The generator and filter assembly then can be lifted out and away from the housing as seen in figure 111. With the generator removed from the housing, all the components are easily located.

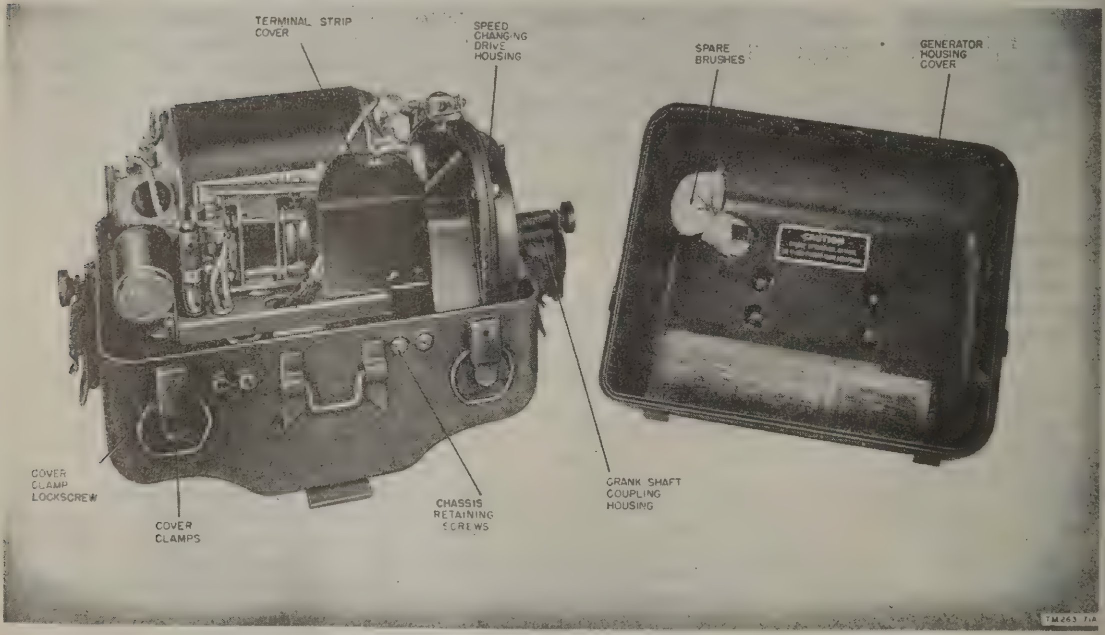

TERMINAL STRIP COVER
SPEED CHANGING DRIVE HOUSING
SPARE BRUSHES
GENERATOR HOUSING COVER
COVER CLAMP LOCKSCREW
COVER CLAMPS
CHASSIS RETAINING SCREWS
CRANK SHAFT COUPLING HOUSING
TM263 71A

Figure 110. Generator GN–58–(*), disassembly illustration.

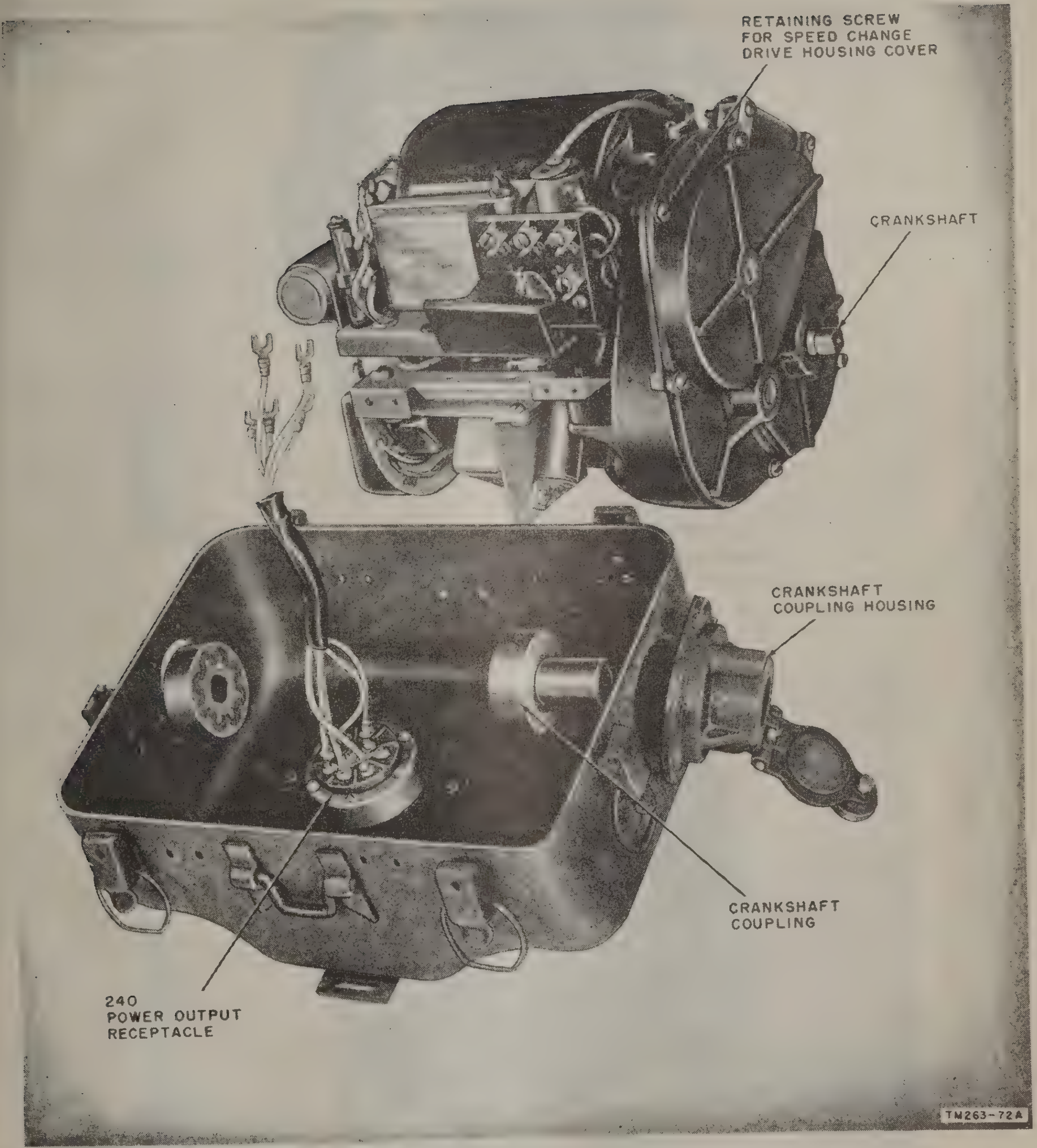

RETAINING SCREW FOR SPEED CHANGE DRIVE HOUSING COVER
CRANKSHAFT
CRANKSHAFT COUPLING HOUSING
CRANKSHAFT COUPLING
240 POWER OUTPUT RECEPTACLE
TM263-72A

Figure 111. Generator GN–58–(*), removed from bottom half of housing.

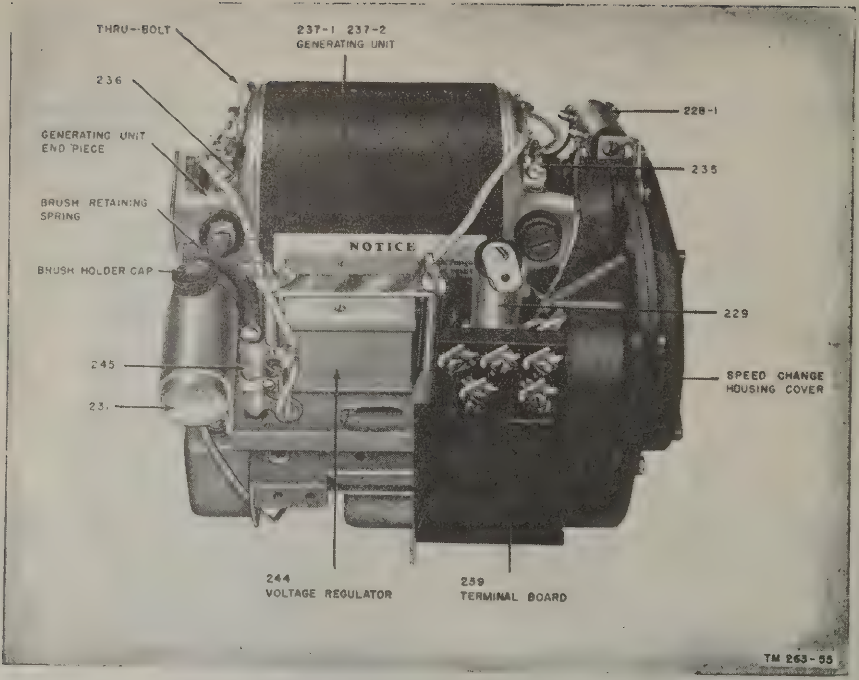

THRU-BOLT
237-1 237-2
GENERATING UNIT
236
228-1
GENERATING UNIT
END PIECE
235
BRUSH RETAINING
SPRING
NOTICE
BRUSH HOLDER CAP
229
245
SPEED CHANGE
HOUSING COVER
231
244
VOLTAGE REGULATOR
239
TERMINAL BOARD
TM 263-55

Figure 112. Generator GN-58-(*), parts location (top).

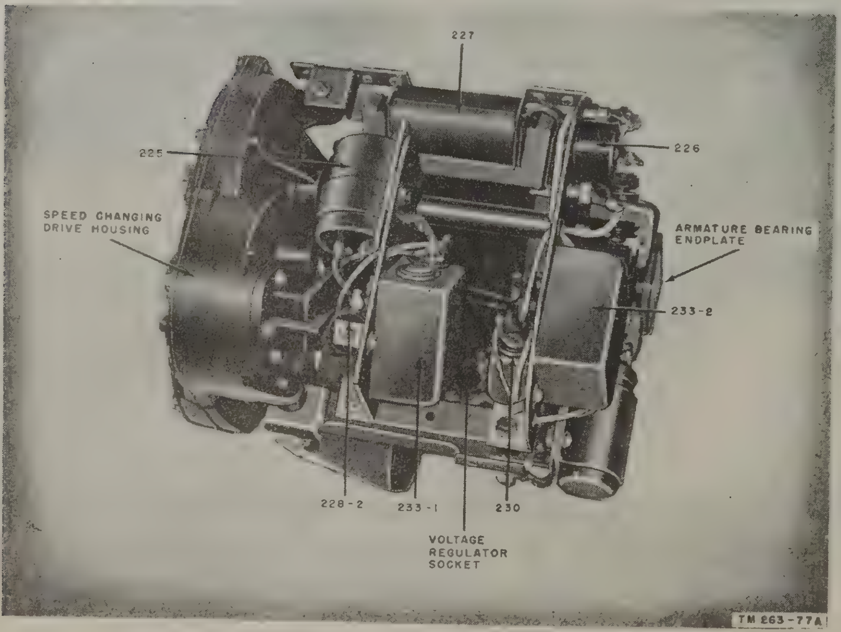

227
225
226
SPEED CHANGING
DRIVE HOUSING
ARMATURE BEARING
ENDPLATE
233-2
228-2
233-1
230
VOLTAGE
REGULATOR
SOCKET
TM 263-77A

Figure 113. Generator GN-58-(*), parts location (bottom).

53. Localizing Trouble in Generator GN–58–(*)

Symptom	Probable trouble	Correction
H-v circuit defective	1*a*. Choke coil 228–1 or 228–2 is open *b*. Capacitor 233–1 or 233–2 is shorted	1*a*. Remove the positive h-v brush. *b*. Replace capacitor.
L-v circuit defective	2*a*. Choke coil 225, 226, or 227 is open *b*. Capacitor 230 or 231 is shorted	2*a*. Remove the positive low voltage brush. Check resistance of these coils. *b*. Replace capacitor.
Excessive sparking under brushes.	3. Worn, dirty, or cracked brushes	3. Replace defective brushes, being sure to fit new brushes to commutator. See figure 123.
Both high and low output voltages vary within wide limits.	4*a*. Resistor 245 defective *b*. Voltage regulator defective	4*a*. Replace resistor 245. *b*. Replace voltage regulator.

154. D-c Resistances of Generator GN–58–(*) Choke Coils

Note. Remove Cord CD–1086 from power output receptacle 240 before taking resistance readings.

Coil	Ohms
225	10.5
226	.03
227	.12
228–1	7.
228–2	7.

155. Sectionalizing Trouble in Vibrator Power Unit PE–237

a. In order to check the voltage outputs of the power supply under load, it is necessary to remove the top cover of the unit and make measurements on the terminal board to which power output receptacle 734 is connected.

b. Set voltage selector switch 735 to the proper setting corresponding to the voltage of the battery to be used.

c. Remove the terminal board cover plate which is shown in figure 114. This will expose the terminal board spade lug connections. The numbers on the board correspond to those on power output receptacle 734.

Caution: There are potentials up to 500 volts across some of the terminal board contacts. Be extremely careful when taking the following measurements.

Symptom	Probable trouble	Correction
1. No voltage output from any terminal of power output receptacle 734. No vibrator hum is heard. Control Ⓔ in transmitter on SEND or STANDBY.	1*a*. Circuit breaker 728 open or defective. *b*. Relay 726 contacts defective.	1. Further disassembly of power supply is necessary to check circuit breaker. See paragraph 157.
2. Control Ⓔ on SEND position. No output voltage to ground from terminals 20, 21, 32, and 34. No loud hum is heard from the h-v vibrator. Tube VT–249 (1006) does not light.	2*a*. Vibrator VB–16 defective *b*. Coil of relay 726 open. If low hum is heard from STANDBY vibrator, and there is normal voltage from terminals 23 and 33 of receptacle 734 to ground, then the contacts of relay 726 definitely have not been actuated, and relay coil 726 is probably open.	2*a*. Replace Vibrator VB–16. *b*. Check continuity by: (1) Removing Cord CD–1086 connector from output receptacle 734. (2) Pressing ON button. (3) Turning voltage selector switch to 6V. position (4) Placing one ohmmeter test prod on the positive (+) battery cable and other in terminal 35 of power output receptacle 734

155. Sectionalizing Trouble in Vibrator Power Unit PE–237—Continued

<table>
<tr><th>Symptom</th><th>Probable trouble</th><th>Correction</th></tr>
<tr><td></td><td></td><td>(5) Reading should be 30 ohms. Infinite reading (∞) indicates (coil 726) is open.
c. Refer to paragraph 157.</td></tr>
<tr><td>3 Control Ⓔ in SEND position. No voltage to ground on power output receptacle 734 terminals 20, 21, and 32. No hum heard. Voltages on terminals 22, 23, and 34 are normal.</td><td>3a. Faulty Vibrator VB–16
b If no vibrator hum is heard and vibrator has been replaced, then something is defective in components leading to vibrator. Choke coil 704, 705–11, or 705–12 leading to Vibrator VB–16 may be open, if voltage outputs are normal on only one or two voltage selector switch positions.</td><td>3a. Replace Vibrator VB–16.
b. Check continuity of these coils.
(1) Remove battery and press ON button.
(2) Remove Cord CD–1086.
(3) Remove Vibrator VB–16.
(4) Place one ohmmeter test prod on the positive (+) battery cable.
(5) For the other test prod and also the position of the voltage selector switch, use the following table:
<table>
<tr><th>Coil</th><th>Position of switch 735</th><th>Other test prod</th><th>Reading</th></tr>
<tr><td>704</td><td>24V.</td><td>Terminal 16 of Vibrator VB–16 socket.</td><td>4 ohms</td></tr>
<tr><td>705–11</td><td>6V.</td><td>Terminal 11 of Vibrator VB–16 socket.</td><td>1 ohm</td></tr>
<tr><td>705–12</td><td>12V.</td><td>Terminal 16 of Vibrator VB–16 socket.</td><td>1 ohm</td></tr>
</table>
If reading of infinity (∞) is obtained for a coil, that coil is open. Further disassembly is necessary. See paragraph 157.</td></tr>
<tr><td>4. Control Ⓔ in SEND position. Loud h-v vibrator hum heard. Tube VT–249 (1006) does not light.</td><td>4a. Faulty h-v rectifier Tube VT–249 (1006).
b. Major internal defect</td><td>4a. Replace tube.
b. See paragraph 157.</td></tr>
<tr><td>5. Control Ⓔ on STANDBY. No voltage output on terminals 22, 23, and 33. On STANDBY, no vibrator hum is heard. Voltage outputs are normal in SEND position of control Ⓔ.</td><td>5a. Relay coil 727 open
b. Vibrator VB–1 defective
c. Choke coil 705–13 open</td><td>5a. Check continuity of coil 727.
(1) Disconnect battery.
(2) Remove Cord CD–1086.
(3) Turn voltage selector control to the 6V. position.
(4) Place one ohmmeter test prod on the positive (+) battery lead and the other prod into terminal 23 of power output receptacle 734. Reading should be approximately 10.5 ohms. If infinite reading (∞) is obtained, then relay coil 727 is open.
b. Replace Vibrator VB–1.
c. See paragraph 157.</td></tr>
</table>

155. Sectionalizing Trouble in Vibrator Power Unit PE–237—*Continued*

Symptom	Portable trouble	Correction
6. Control Ⓔ on STANDBY. No voltage output on terminal 33. Normal voltage on other terminals.	6*a*. Defective stand-by rectifier Tube VT–195 (1005). *b*. Major internal defect	6*a*. Replace tube. *b*. See paragraph 157.

156. Disassembly of Vibrator Power Unit PE–237

Before any further trouble shooting can be attempted, it is necessary to remove the unit from the housing. This is done as follows:

a. Remove the rubber-covered cables which connect the power supply to the vehicular battery.

(1) Unscrew the clamp nuts on the battery cable bushings (fig. 114).

(2) Remove the nuts holding the battery cable lugs to the terminals on the vibrator chassis (fig. 114).

(3) Lift the lugs off the screws and pull the cables through the bushings, completely out of the vibrator housing (fig. 115).

b. Remove power output receptacle 734.

(1) Loosen the screws on the terminal board numbered from 20 to 35, and remove the spade lugs secured by these screws. Do not remove the screws or they may be lost. Make a written note of the color coding on the wires so that reconnection will be simplified (fig. 114).

(2) Remove the screws around the outside flange of receptacle 734. Gently pry the flange away from the housing, and pull the entire receptacle out, including the wires attached to its terminals (fig. 115).

c. Remove the power unit chassis from the housing.

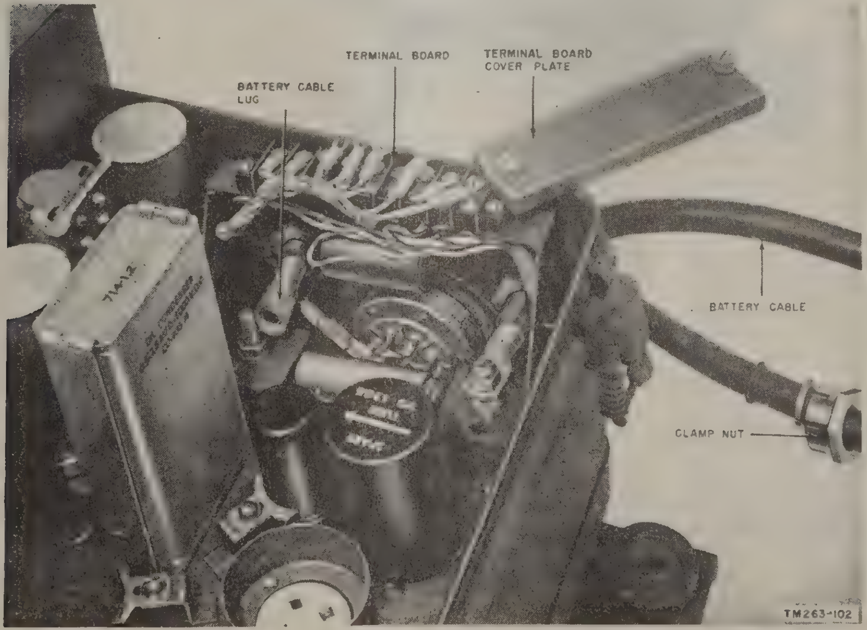


Figure 114. Vibrator power unit PE–237, terminal board and battery cable connections.

(1) Turn Vibrator Power Unit PE–237 upside down and unscrew the six nuts on the bottom of the housing.

(2) The chassis should no longer have any connection to the housing. Lift the housing up and away from the chassis.

d. The bottom of the chassis has metal cross bracing members screwed to it. The bracing is held by screws along the sides of the chassis and two screws in the middle of the bracing (fig. 116).

(1) Unscrew the 12 screws along the sides of the chassis which hold the ends of the bracing bands.

(2) Unscrew the two screws in the center cross-brace.

(3) Lift the bracing completely off the bottom of the chassis, exposing the wiring underneath.

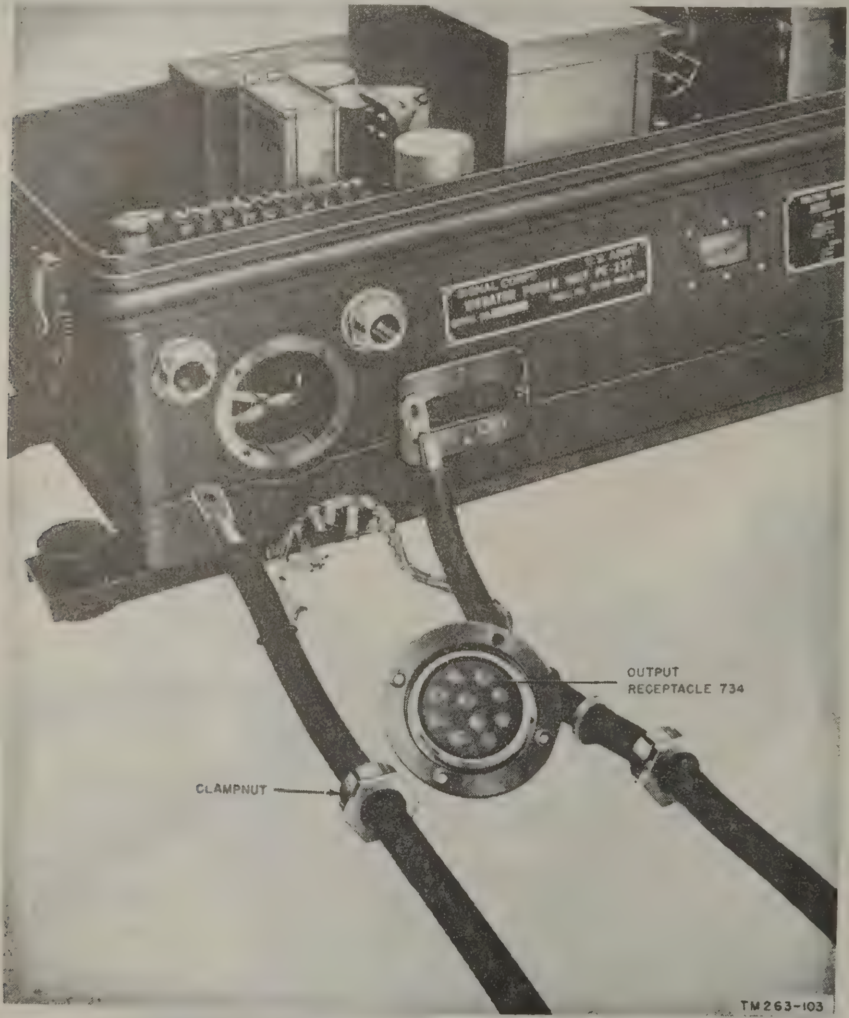
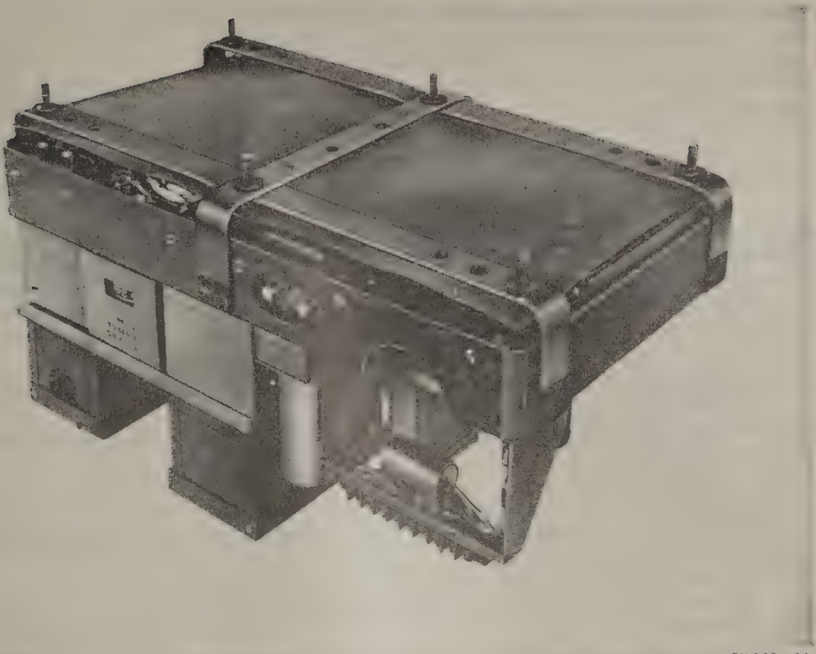


Figure 115. Vibrator power unit PE–237, battery cables and power output receptacle 734.



TM 263-104

Figure 116. Vibrator power unit PE-237, cross bracing on the bottom of the chassis.

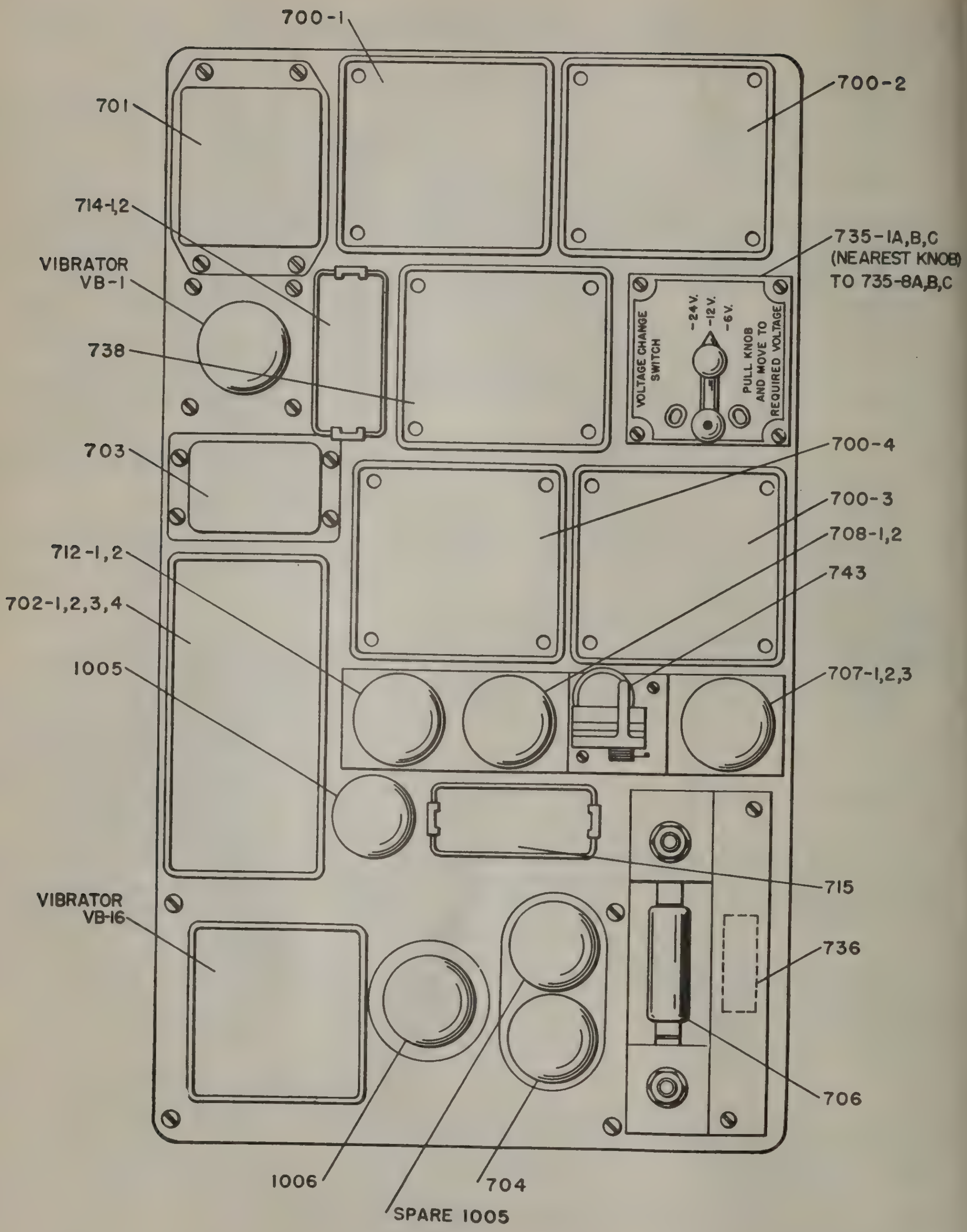
157. Localizing Trouble in Vibrator Power Unit PE-237

Symptom	Probable trouble	Correction
STANDBY CIRCUIT:		
1. No voltage output on terminal 33. Voltage normal on terminals 22 and 23. Hum is heard from STANDBY on Vibrator VB-1.	1*a*. Refer to figure 122. There may be a disconnection between primary of power transformer 702-1 and contacts 2 and 3 of Vibrator VB-1. See figure 119.	1*a*. Remove Vibrator VB-1, and check continuity of choke coils 705-13, 705-14, and 705-15. Check primary of transformer 702-1 (approximately 27 ohms). To check for continuity of switches 735-2C and 735-3A, place one test prod in contact 2 and the other in contact 3 of vibrator socket 731.
	b. Defective secondary coils of transformer 702-1.	*b*. Remove tube 1005, and check for continuity at socket 730 between pins 3 and 5 (approximately 1,500 ohms) and pins 6 and 8 (approximately 3 ohms).
	c. Defective stand-by rectifier tube 1005.	*c*. Replace tube.
	d. Choke coil 702-4 or resistor 737 may be open.	*d*. Remove stand-by rectifier tube and check continuity by placing one test prod on terminal 33 of the terminal strip and the other prod at contact 6 of socket 730. A reading of 2,000 ohms should be obtained. If an infinite (∞) reading is found, check choke coil and resistor individually. If short is

Symptom	Portable trouble	Correction
		found, replace capacitors 707–2 and 707–3.
	e. Shorted buffer capacitor 711	*e.* Replace capacitor 711 with one of exactly the same capacity.
RECEIVER FILAMENT SUPPLY:		
2. No voltage on terminals 22 and 23 on SEND position only of control Ⓔ. Voltage output of terminal 33 is normal.	2*a.* The 3.6-ohm section of resistor 719 is probably open.	2*a.* Check resistance of the 3.6-ohm section by placing the test prods directly across it.
	b. If the voltage output of terminal 33 is not normal, then relay coil 727 is probably open.	*b.* Check the resistance of coil of relay 727.
3. No voltage on terminals 22 and 23 on SEND or STANDBY position of control Ⓔ. No voltage on terminal 33.	3*a.* The 2.71-, 13.3-, or 26.7-ohm section of resistor 719 is open.	3*a.* Check resistance of resistor 719.
	b. Choke coil 703 is open	*b.* Check resistance of choke coil 703.
4. No voltage on terminals 22 and 23 in SEND or STANDBY position of control Ⓔ. Voltage on terminal 33 is normal.	4. Capacitor 708–1 or 708–2 is shorted	4. Replace capacitors 708–1 and 708–2.
KEYING RELAY SUPPLY CIRCUIT:	See figure 90.	
5. No voltage on terminal 34, in SEND position of control Ⓔ. All other voltages are normal.	5*a.* Contacts of relay 726 defective	5*a.* Inspect contacts.
	b. Capacitor 707–1 shorted	*b.* Replace capacitor units 707–1, –2, and –3.
PLATE AND SCREEN GRID VOLTAGE SUPPLIES:		
6. No voltage output on terminals 20, 21, and 32. H-v rectifier Tube VT–249 (1006) does not light. No h-v Vibrator VB–16 hum is heard. Voltage output is normal on STANDBY position of control Ⓔ.	6. See figure 86.	
	a. It is assumed that relay 726 contacts and choke coils 704, 705–11, and 705–12 have been checked.	6*a.* See paragraph 155, symptom 2.
	b. Vibrator VB–16 defective	*b.* Replace Vibrator VB–16.
	c. Capacitor 709–1, 709–2, 710–11, 710–12, 710–13, or 741 may be shorted.	*c.* Refer to figures 56 and 57. Remove Vibrator VB–16 and check the capacitor for shorts.
7. No voltage output on terminals 20, 21, and 32. Tube VT–249 (1006) does not light. Loud hum is heard from Vibrator VB–16.	7*a.* Vibrator VB–16 defective	7*a.* Replace Vibrator VB–16.
	b. There may be a break in the line between terminals 4 of transformers 700–1, –2, –3, –4, and 738, and switch 735–4A, –5A, –6A, –7A, and –8A.	*b.* Remove battery and press ON button. Check for continuity between positive (+) battery cable and terminal 4 of each of the transformers.
8. No voltage output on terminals 21 and 32. All other terminal voltages are normal. H-v rectifier Tube VT–249 (1006) filament does not light.	8. See figure 87.	
	a. Defective tube	8*a.* Replace tube.
	b. Defective filament circuit. Choke coil 705–16 or 705–17 may be open. Secondary of transformer 738 may be open.	*b.* Remove Tube VT–249 (1006), and check the resistance between pins 1 and 4 of socket 733. The reading should be close to zero.
	c. Primary of transformer 738 may be open. Choke coil 705–3 or 705–4 may be open.	*c.* Remove Vibrator VB–16 from its socket and turn voltage selector switch to 24V. Check the resistance between terminals 3 and 4 of the vibrator socket. The read-

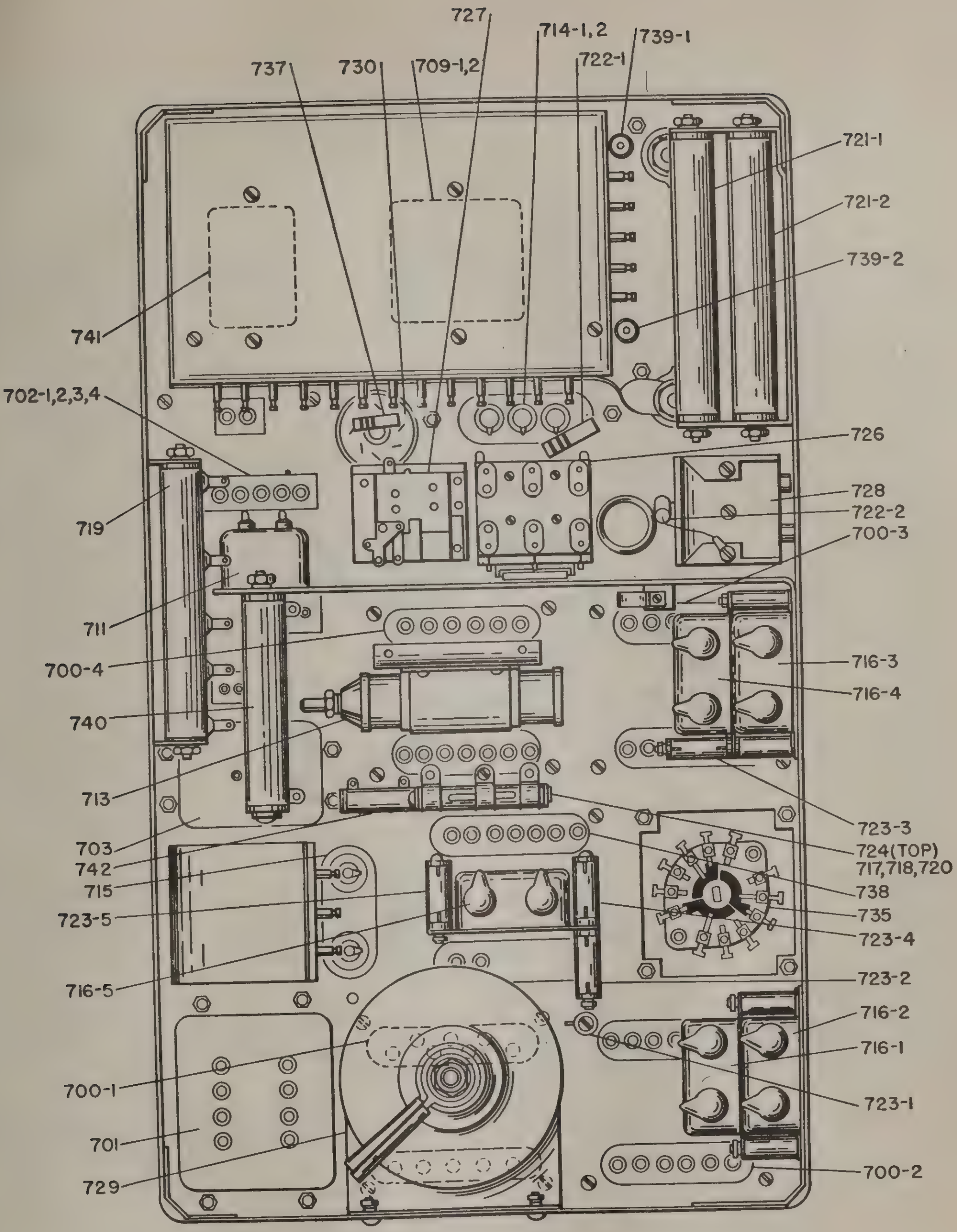
57. Localizing Trouble in Vibrator Power Unit PE–237—Continued

Symptom	Portable trouble	Correction
		ing should be approximately 2.5 ohms. If not, check each item individually.
	d. One of capacitors 716–3, 739–1, and 739–2 may be shorted.	*d.* Replace capacitors.
9. No voltage output on terminals 21 and 32. H-v rectifier tube filament lights up. All other voltages are normal.	9*a.* Discontinuity in h-v rectifier plate circuit. Choke coil 725–1 or 725–2 may be open. One of the secondary windings of transformers 700–1 through 700–4 may be open.	9*a.* Remove Tube VT–249 (1006) from socket 733. Check resistance between terminals 2 and 3 of the socket. The reading should be approximately 200 ohms. If this is not obtained, check each choke and plate circuit secondary coil individually.
	b. Choke coil 725–3 may be open	*b.* Check resistance of coil 725–3. The reading should be approximately 10 ohms.
	c. Choke coil 702–3 may be open	*c.* Check resistance of coil 702–3. The reading should be approximately 20 ohms.
	d. Capacitor 714–1, 714–2, 715, or 736 may be shorted.	*d.* Replace capacitor.
10. No voltage output on terminal 21. All other voltage outputs are normal.	10. Resistor 721–1 or 721–2 is open	10. Check resistance from terminal 21 through terminal 32.
TRANSMITTER FILAMENT VOLTAGE SUPPLY CIRCUIT:	See figure 88.	
11. No voltage on terminal 20. All other voltage outputs are normal.	11*a.* Resistor 724 open	11*a.* Check resistance of resistor 724.
	b. Choke coil 702–2 open	*b.* Check resistance of coil 702–2.
	c. The selenium rectifier circuit may be open.	*c.* Using the lowest ohmmeter range only, place the test prods on terminals 20 and 24 on the terminal strip. The reading should be about 13 ohms. When the test leads are reversed, the reading should be above 1,000 ohms.
	d. There may be an open circuit in one of the secondary coils of transformers 700–1 through 700–4. Primary coil on transformer 701 may be open.	*d.* Unsolder the lead to terminal 1 of transformers 701, and check for continuity between lead and terminal. If an infinite (∞) reading is obtained, check each coil individually.


700-1
701
700-2
714-1,2
VIBRATOR VB-1
735-1A,B,C (NEAREST KNOB) TO 735-8A,B,C
VOLTAGE CHANGE SWITCH
-24 V.
-12 V.
-6 V.
PULL KNOB AND MOVE TO REQUIRED VOLTAGE
738
703
700-4
700-3
712-1,2
708-1,2
743
702-1,2,3,4
1005
707-1,2,3
715
VIBRATOR VB-16
736
706
1006
704
SPARE 1005

TM 263-C2-3

Figure 117. Vibrator power unit PE-237 (serial Nos. 22436 through 26799), top view for parts identification purposes.


727
714-1,2
739-1
737
730
709-1,2
722-1
721-1
721-2
739-2
741
702-1,2,3,4
726
728
722-2
700-3
719
711
700-4
716-3
716-4
740
713
723-3
703
724(TOP)
717,718,720
742
715
738
723-5
735
723-4
716-5
723-2
716-2
716-1
700-1
723-1
701
729
700-2

TM 263-C2-2

Figure 118. Vibrator power unit PE–237 (serial Nos. 22436 through 26799), bottom view for parts identification purposes.

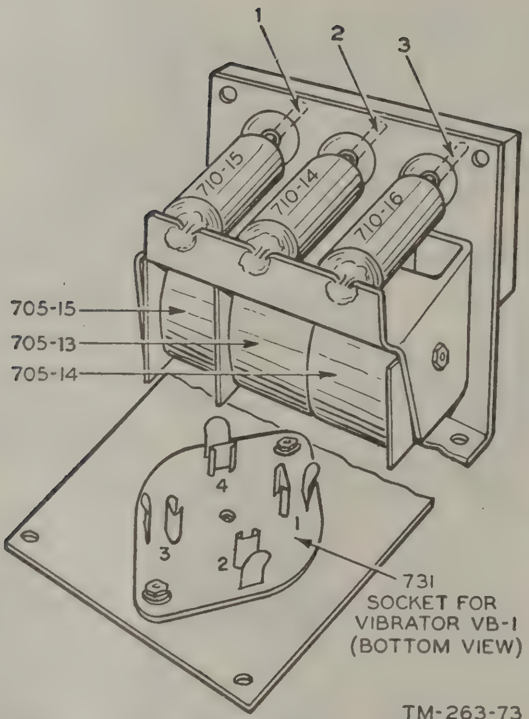
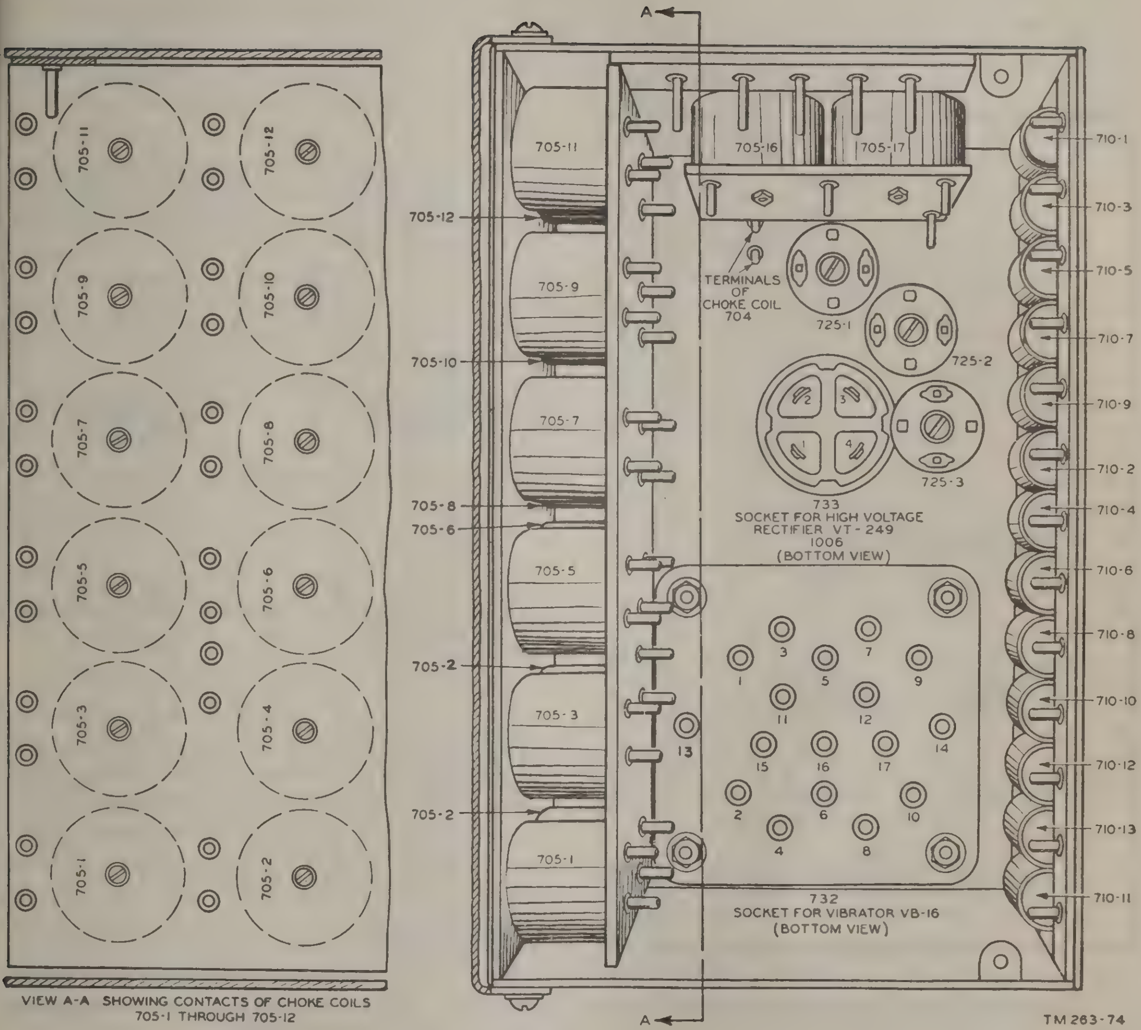

1
2
3
710-15
710-14
710-16
705-15
705-13
705-14
4
3
2
1
731
SOCKET FOR
VIBRATOR VB-1
(BOTTOM VIEW)
TM-263-73

Figure 119. Shielded compartment for stand-by vibrator socket and filter unit, viewed from bottom of chassis.


A
705-11
705-12
705-9
705-10
705-7
705-8
705-5
705-6
705-3
705-4
705-1
705-2
705-16
705-17
710-1
710-3
710-5
710-7
710-9
710-2
710-4
710-6
710-8
710-10
710-12
710-13
710-11
TERMINALS OF CHOKE COIL 704
725-1
725-2
725-3
733
SOCKET FOR HIGH VOLTAGE RECTIFIER VT-249
1006
(BOTTOM VIEW)
732
SOCKET FOR VIBRATOR VB-16
(BOTTOM VIEW)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
A

VIEW A-A SHOWING CONTACTS OF CHOKE COILS 705-1 THROUGH 705-12

TM 263-74

Figure 120. Shielded compartment for h-v vibrator socket and filter unit, viewed from bottom of chassis.

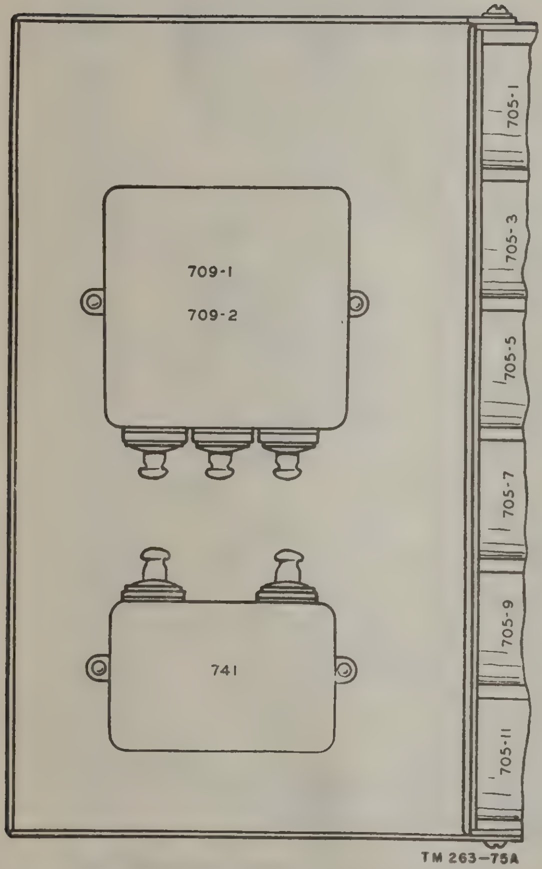
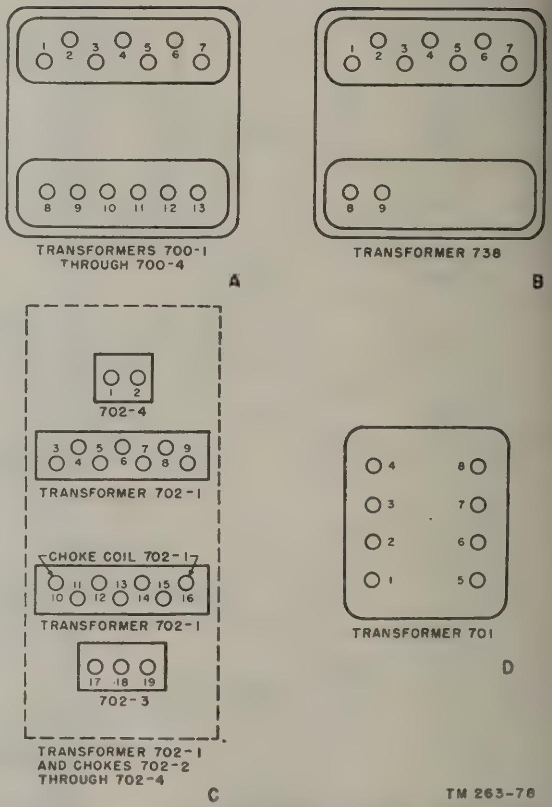

705-1
705-3
705-5
705-7
705-9
705-11
709-1
709-2
741
TM 263—75A

Figure 121. Inside view of door cover for h-v filter compartment.


1 2 3 4 5 6 7
8 9 10 11 12 13
A
1 2 3 4 5 6 7
8 9
B
1 2
702-4
3 4 5 6 7 8 9
CHOKE COIL 702-1
10 11 12 13 14 15 16
17 18 19
702-3
C
4 3 2 1
8 7 6 5
D
TM 263-78

TRANSFORMERS 700-1 THROUGH 700-4

TRANSFORMER 738

TRANSFORMER 702-1

TRANSFORMER 702-1

TRANSFORMER 702-1 AND CHOKES 702-2 THROUGH 702-4

TRANSFORMER 701

Figure 122. Vibrator power unit PE–237, transformer and choke coil terminal designations.

Section III. REPAIRS

158. Replacement of Parts

a. Most of the parts in Radio Set AN/GRC–9 are readily accessible and easily replaced if found defective. If the BAND change switches need replacement, mark the wires connected to the switch with tags or other devices to avoid misconnection when the new switch is installed. Follow this practice whenever replacement requires the disconnection of numerous wires.

b. When removing screws from the units try to keep the screws in individual groups corresponding to the components which they fasten to the chassis. This will speed up the reassembly process.

c. Be careful when resoldering not to allow drops of solder to fall onto other wiring and components. This may cause future trouble if care is not taken.

159. Refinishing

Instructions for refinishing badly marred panels on exterior cabinets are given in TM 9–2851.

160. Replacing Brushes in Generator GN–58–(*)

a. There are standard replacement brushes for Generator GN–58–(*), which are already shaped to fit the contour of the armature. These brushes also have polarity markings on them. The brushes should be replaced so that the polarity markings face upward, in the normal operating position of the generator. If this is not observed, damage to the commutator may result.

b. Some brush replacements will necessitate a *sand-in* operation to allow the brush to make full contact with the armature. If the operation is not performed, excessive heating of the brush and commutator will occur, also, excessive sparking will ruin the commutator.

c. Sanding-in may be accomplished by using two strips of #00 sandpaper about 5 inches long and almost as wide as the h-v and l-v armatures. Wrap the strip of sandpaper around the commutator *with the sand surface out.* Insert the brushes in the brush holders, and replace the brush caps over the brush spring so that the brushes are pressed tightly against the sandpaper. Holding the ends of the sandpaper so as to stretch it tightly against the commutator (fig. 123), rotate the armature back and forth until the full width of the brush face is making contact against the sandpaper, as indicated by the sanding marks or scratches on the contact surface of the brush when the brush is removed for inspection.

d. Never apply oil, grease, or any other lubricant to the brush, commutator, or brush holder.

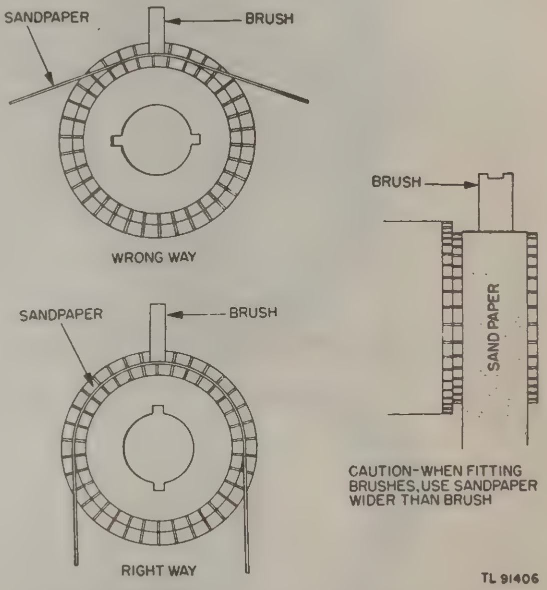


Figure 123. Correct and incorrect methods of fitting a brush to the commutator.

161. Removal of Armature of Generator GN–58–(*)

The armature is not to be repaired, except in a depot maintenance unit. This information is given for those units where the armature is to be replaced, in case they are defective. The procedure is as follows:

a. Remove all brushes.

b. Take off the speed change housing cover by removing the six screws around the edge of the cover (figs. 111 and 124).

c. Remove the screw that secures the sprocket gear to the armature shaft (fig. 111).

d. The sprocket gear is press-fitted to the shaft. Pry it off gently (fig. 125).

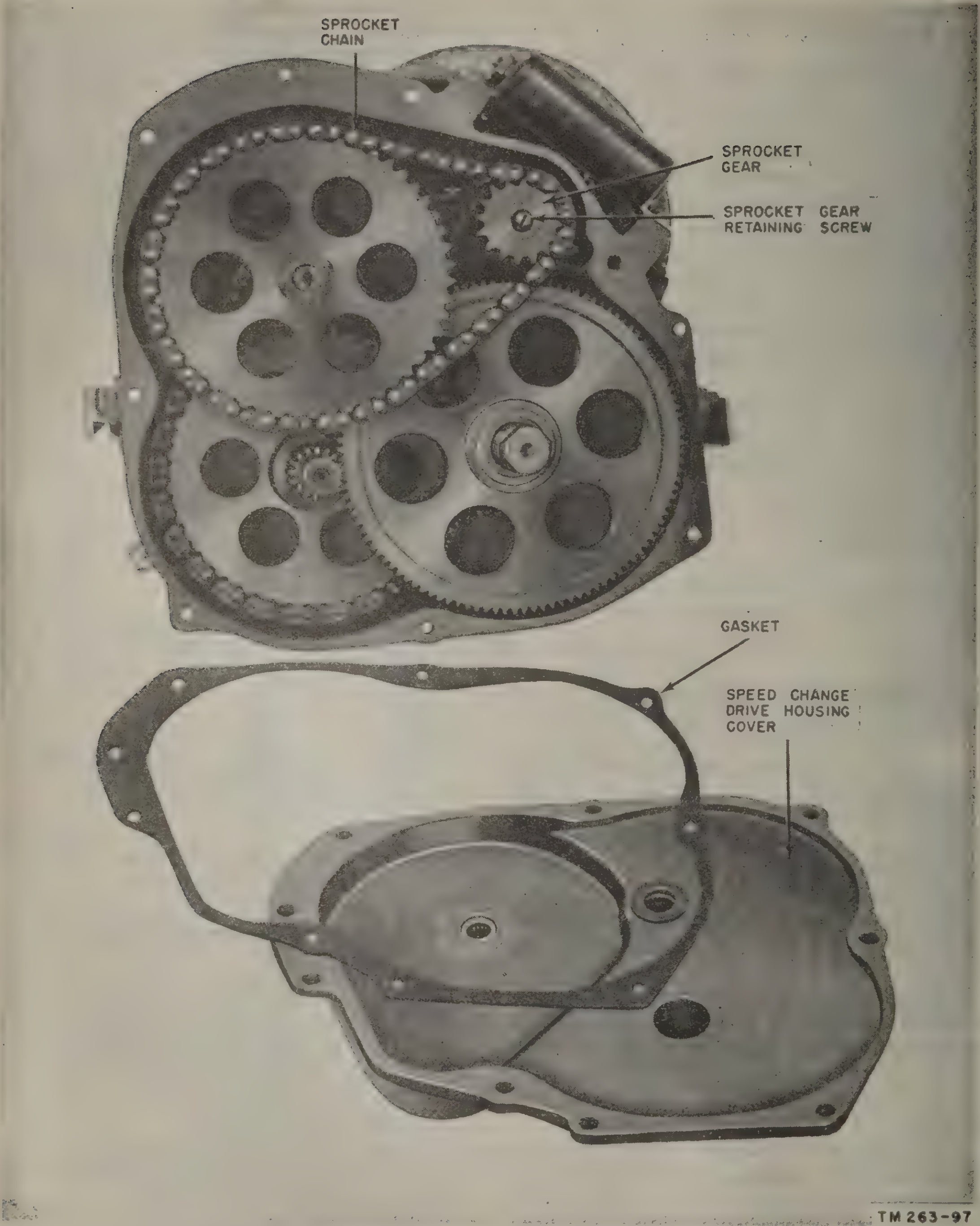

SPROCKET CHAIN
SPROCKET GEAR
SPROCKET GEAR RETAINING SCREW
GASKET
SPEED CHANGE DRIVE HOUSING COVER
TM 263-97

Figure 124. Speed change drive housing, gasket, and cover removed.

e. Remove the two through-bolts from the left generating unit endpiece (fig. 126).

f. Pry the left *generating unit endpiece* away from the generating unit, and slip it off the armature shaft bearing. Be careful not to damage any of the wiring. It may be necessary to remove the left bearing plate so that the endpiece can be forced off and away from the bearing which is press-fitted to the armature shaft.

g. The armature now can be pulled out gently through the generating unit (fig. 127).

162. Replacement of Armature of Generator GN–58–(*)

Reverse the disassembly procedure in paragraph 161, being careful of the following:

a. The bottom through-bolt passes through a connecting lug before it emerges from the generating unit. Before screwing on the nut to the bolt, be sure that the lug is around the bolt inside the generating unit.

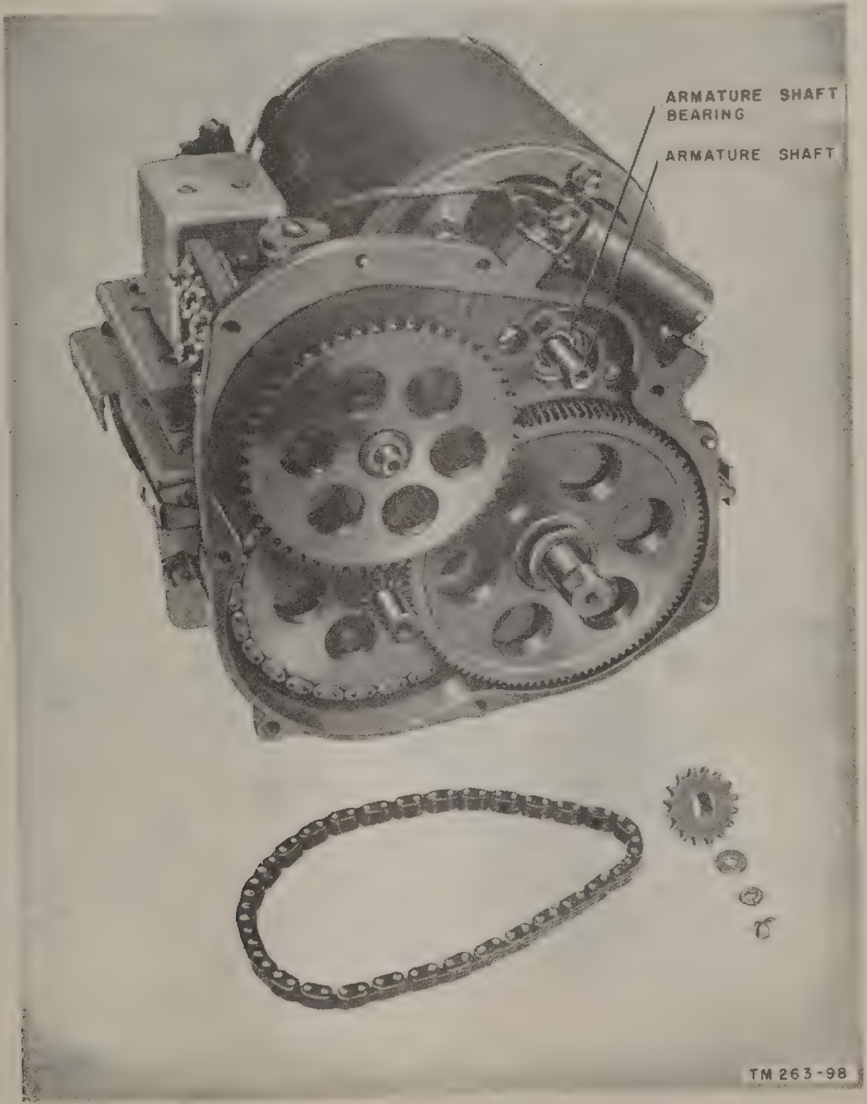


Figure 125. Generator GN–58–A, sprocket gear, and sprocket chain removed.

b. Be sure that the sprocket chain is fitted completely about the sprocket gear and is sufficiently lubricated.

c. Do not forget to replace the gasket before screwing on the speed change housing cover.

163. Adjustment of Apparatus

a. Transmitter Tuning Control (I) Knob. Be sure that when replacing the tuning knob, the setscrew in the knob is tightened up against the flat side of the tuning control shaft. If the setscrew should be tightened incorrectly on the round part of the shaft, the dial readings on the knob will not correspond to the frequency to which the tuning capacitor will actually be tuned.

b. Transmitter Keying Relay K101.

Note. The adjustment of the relays in the radio set

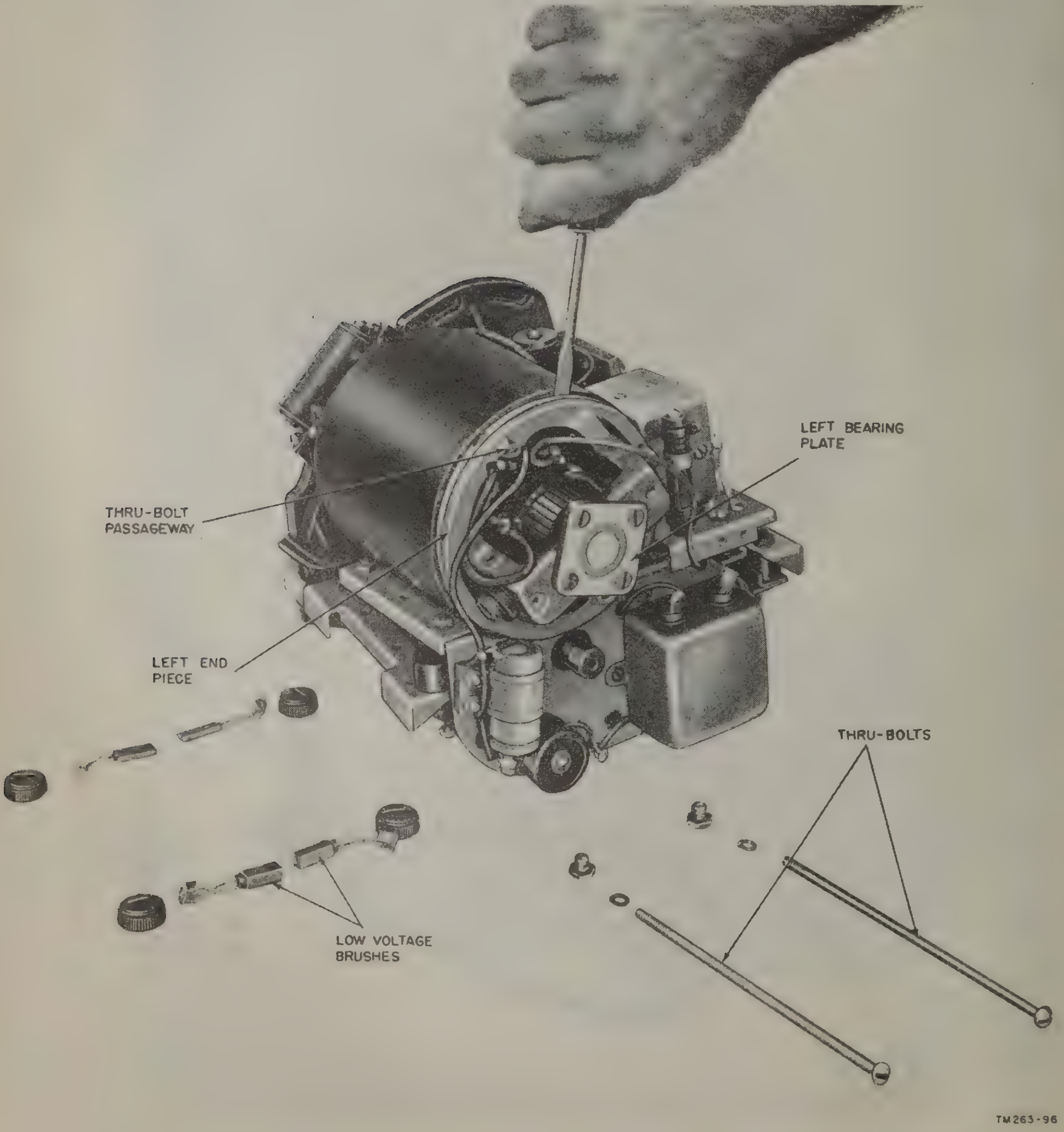

LEFT BEARING PLATE
THRU-BOLT PASSAGEWAY
LEFT END PIECE
THRU-BOLTS
LOW VOLTAGE BRUSHES
TM263-96

Figure 126. Generator GN-58-A, prying off generating unit left endpiece.

are to be made only in fixed depot maintenance centers by skilled personnel, and then only under extreme necessity.

(1) The necessary sequence of operation of the relay is as follows: Contacts 3 and 4 shall close before contacts 9 and 10. This is important, otherwise p-a tube V103 may be ruined.

(2) The air gap between contacts 4 and 5 and between 1 and 2 is .040 inch minimum when contacts 3 and 4 are closed. Contacts 9 and 10 are open with an air gap of .25 inch minimum when contacts 7 and 8 are closed.

(3) The contact pressures of the relay contacts are 29 grams, plus or minus 3 grams.

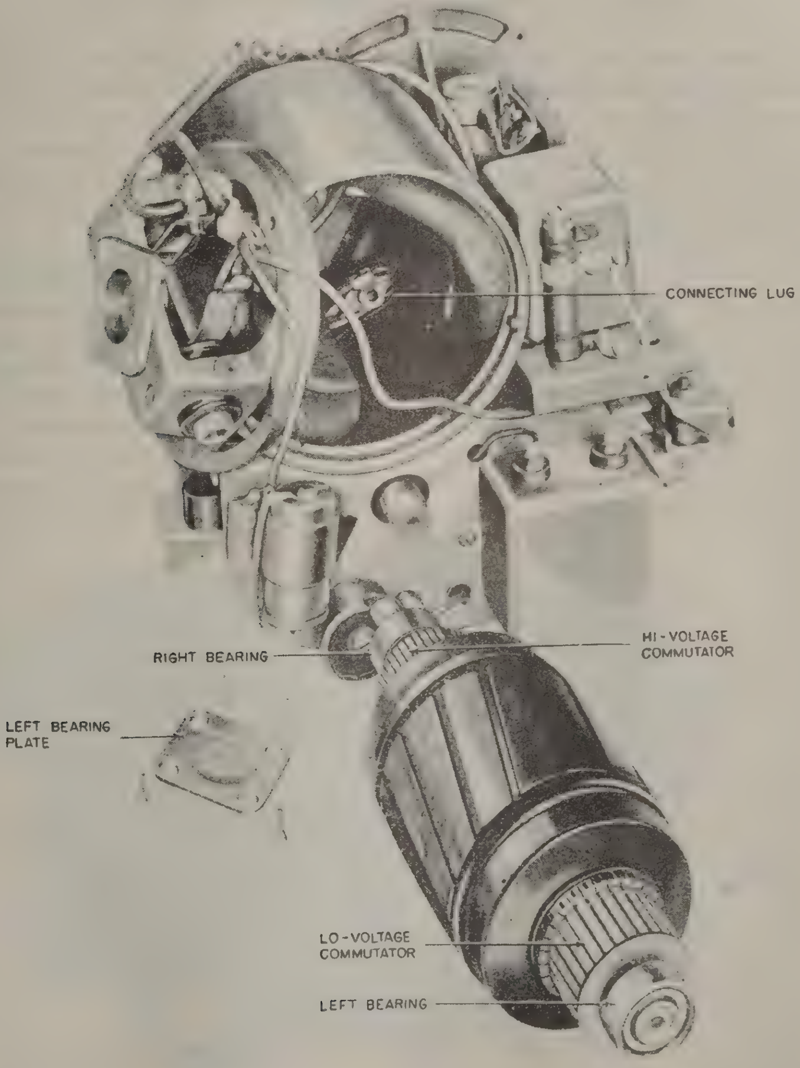

CONNECTING LUG
HI-VOLTAGE COMMUTATOR
RIGHT BEARING
LEFT BEARING PLATE
LO-VOLTAGE COMMUTATOR
LEFT BEARING
TM 263-99

Figure 127. Armature removed from generating unit.

c. ADJUSTMENT OF VOLTAGE REGULATOR IN GENERATOR GN–58–(*). A vibrating contact-type voltage regulator is incorporated in the hand generator. Adjust, only when necessary, with Signal Corps Gauge TL-127 (stock No. 6Q45127) according to directions inside the cover of the generator.

d. ADJUSTMENT OF INDEX MARK OF TRANSMITTER MAIN TUNING CAPACITOR. The flat of the main tuning capacitor shaft should be rotated to position for easy tightening up of setscrew of the frequency control dial after the assembly is replaced. The setscrew of the frequency control dial must be seated on the flat of the capacitor shaft, otherwise calibration will be inaccurate. To readjust dial lock, place lock in approximately the normal position, close clamp, and tighten mounting screws.

Section IV. RECEIVER ALINEMENT PROCEDURES

164. Test Equipment Used for Alinement of Receiver Section of Receiver-Transmitter RT–77/GRC–9

a. SIGNAL GENERATOR. The signal generator should be an accurately calibrated instrument producing modulated r-f signals, such as Signal Generator I–72–(*). In addition to 456 kc, the unit must have a range of from 2 mc to 12 mc, covering the three bands of the receiver. The signal generator should have an output of impedance of approximately 100 ohms for best results when the r-f and h-f oscillator circuits are alined. For i-f alinement, these values are not critical. The frequency calibration of the signal generator is extremely important in order that the receiver dial calibration be correct.

b. OUTPUT METER. The output meter in Test Set I–56–(*) is satisfactory.

c. OTHER EQUIPMENT. Additional test equipment necessary are Headset HS–30–(*), a 110-uuf and .05-uf capacitors, and an alinement tool.

165. Preliminary Alinement Procedures

a. Turn on the signal generator and allow it to reach a stable operating temperature (approximately 15 minutes). Using the instruction book furnished with the signal generator, see that it is accurately calibrated.

b. Stand the receiver on its right side; connect the output meter by attaching the two wires from it to Plug PL–55, and insert the

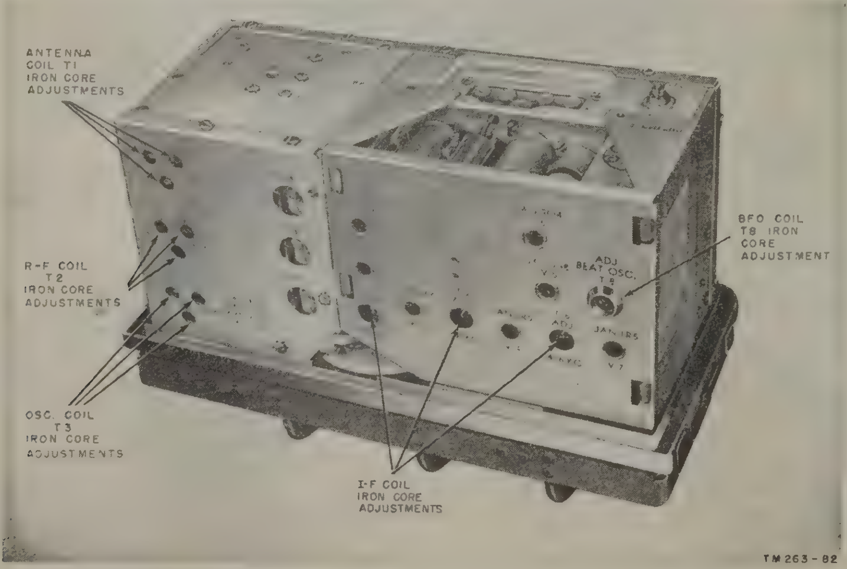

ANTENNA COIL T1 IRON CORE ADJUSTMENTS
R-F COIL T2 IRON CORE ADJUSTMENTS
OSC. COIL T3 IRON CORE ADJUSTMENTS
I-F COIL IRON CORE ADJUSTMENTS
BFO COIL T8 IRON CORE ADJUSTMENT
ADJ BEAT OSC. T8
ADJ
V7
TM 263-82

Figure 128. Receiver top, alinement points.

plug in one of the PHONES jacks. Plug the headset into the other phone jack.

c. Any of the usual power supplies may be used, but the battery power is recommended, because it is a more constant power source. If battery power is available, attach Cord CD–1119 to the BATTERY receptacle on the transmitter and to Battery BA–48.

d. Turn control Ⓔ to STANDBY if Battery BA–48 or Vibrator Power Unit PE–237 is used. If Generator GN–58–(*) is used, turn control Ⓔ to SEND.

e. Allow the receiver and signal generator to warm up for about 15 minutes before any attempt is made at alinement.

166. I-f Alinement
(figs. 128 and 129)

Remove the bottom cover of the receiver and refer to figure 95 for the placement of the i-f transformers. Proceed with the following:

a. Loosen the tuning slug locknuts on the top and bottom of i-f transformers T4, T5, and T6.

b. Turn A. F. GAIN control Ⓖ clockwise to the maximum position. Turn R. F. GAIN control Ⓟ clockwise to the maximum position. Set control Ⓒ to PHONE. Set the output IMPEDANCE switch in the back of the receiver chassis for 250 ohms.

c. Cut out the avc voltage. This can be done most easily by connecting a shorting wire from the terminal board lead of resister R1 to the chassis. The receiver will function normally except that the avc voltage will be shorted to ground.

d. Set the output meter for an impedance of 250 ohms.

e. Set the signal generator at 456 kc. Set the modulation at 30 percent at 400 cycles.

f. Connect the ground side of the signal generator to the receiver chassis.

g. Connect the hot lead of the signal generator output to the signal grid, pin 6 of the second i-f amplifier tube V4, through a .05-uf capacitor.

h. Adjust the signal generator attenuator to produce an approixmate midscale reading on the visual indicating output meter.

Note. As alinement progresses, it may be necessary to reduce the signal generator output to keep the output meter on scale.

i. Adjust the top and bottom screws on i-f transformer T6 until a maximum reading is obtained on the visual indicating output meter.

j. Tighten the locknuts slightly, maintaining the peak output.

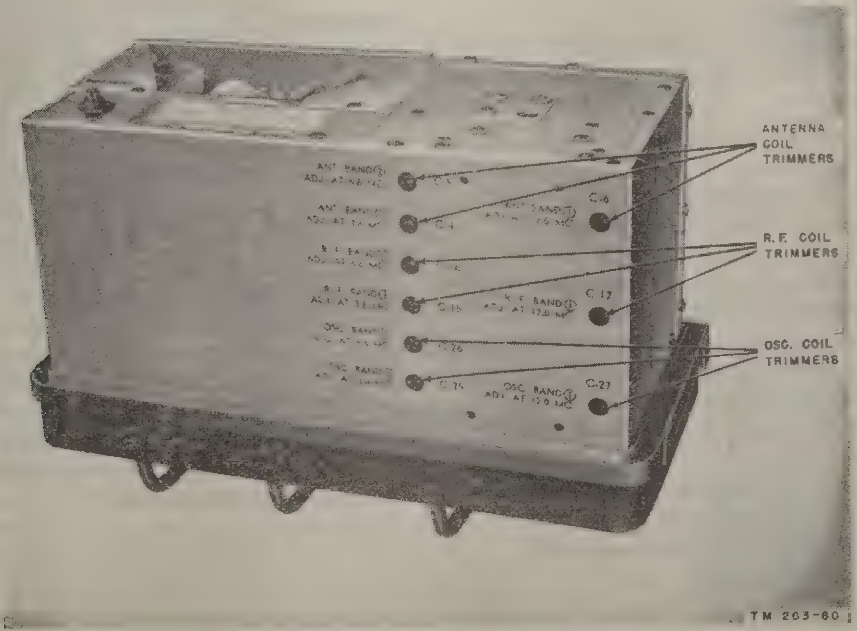


Figure 129. Receiver bottom, alinement points.

k. Repeat steps *g*, *h*, *i*, and *j* above for each of the other two i-f transformers. For transformer T5, connect the hot lead of the signal generator to pin 6 of tube V3. For transformer T4, connect the hot lead to pin 6 of the converter tube V2.

l. When the hot lead is on pin 6 of the converter tube, recheck the settings on all the i-f transformers and then tighten the locknuts snugly, being careful to maintain maximum reading on the output meter.

167. Bfo Alinement

To aline the bfo, use the following procedure:

a. Set the TUNING dial control Ⓝ at 2 mc.

b. Set control Ⓛ at C.W.

c. Turn A. F. GAIN control Ⓞ clockwise to its maximum position.

d. Set the signal generator at 456 kc *with no modulation.*

e. Clip the hot side of the signal generator output to pin 6 of tube V2.

f. Loosen the locknut on the top of the bfo coil T8 and adjust the tuning slug screw for a zero beat.

g. Tighten the locknut, being careful to maintain zero beat after the nut is tightened.

168. R-f Alinement

a. PRELIMINARY ADJUSTMENTS. For the r-f alinement on each of the three bands, the following steps apply:

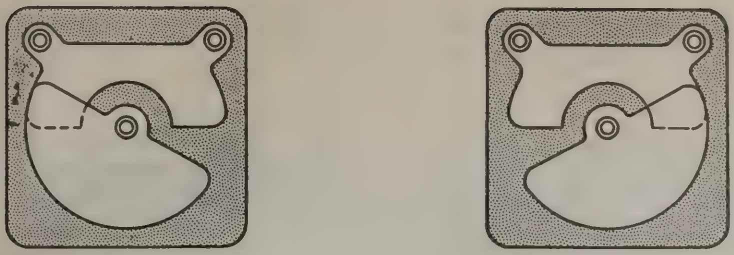
(1) Set the visual indicating output meter at 250 ohms.
(2) Set the IMPEDANCE switch on the receiver chassis at 250 ohms.
(3) Set control Ⓛ to PHONE.
(4) Modulate the signal generator output 30 percent at 400 cycles.
(5) Connect the hot lead of the signal generator output to the ANT. binding post through a 110-uuf capacitor. Connect the ground lead to the receiver chassis.
(6) Control Ⓐ in the transmitter must *not* be set at position 9, 10, or 11.
(7) Disable the avc voltage supply as in paragraph 166*c*.

b. BAND 1 ALINEMENT.

(1) To aline the receiver at the l-f end of BAND 1, proceed as follows:
  (*a*) Set the signal generator at 6.6 mc.
  (*b*) Turn control Ⓜ to BAND 1.
  (*c*) Set the receiver TUNING dial to exactly 6.6 mc.
  (*d*) To aline the BAND 1 coil of r-f transformer T2, carefully adjust the coil ① tuning slug screw (on the top of the receiver chassis) for a maximum deflection on the output meter.
  (*e*) To aline the BAND 1 coil of ANT. transformer T1, carefully adjust the coil ① tuning slug screw (on the top of the receiver chassis) for a maximum deflection on the output meter.
  (*f*) To aline the BAND 1 coil of OSC. transformer T3, carefully adjust the coil ① tuning slug screw (on the top of the receiver chassis) for a maximum deflection on the output meter.
(2) To aline the receiver at the h-f end of BAND 1, proceed as follows:
  (*a*) Set the signal generator at 12 mc.
  (*b*) Set the receiver TUNING dial at exactly 12 mc.
  (*c*) Carefully adjust OSC. BAND 1 trimmer capacitor C27 (on the bottom of the chassis) for a maximum deflection of the output meter.

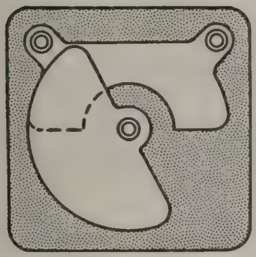
  Caution: It may be found that there are two positions of the OSC. trimmer capacitor C27 which will give a maximum reading on the output meter. In this situation, the trimmer setting *which has less capacity,* is the correct one. Referring to figure 130, a capacitor setting at A gives the same capacity as at A' because of the circular construction of the trimmer, and either setting may be used. If the capacitor adjustment, however, results in the output meter indicating a peak at two points such as at A and B, the correct setting is at A, which gives the minimum amount of capacity.

  (*d*) Adjust the R.F. GAIN BAND 1 trimmer capacitor C17 (on the bottom of the receiver chassis) for maximum deflection of the output meter.



SETTING A

SETTING A'



EITHER ONE OF SETTINGS A AND A' MAY BE USED IF MAXIMUM DEFLECTION IS OBTAINED AT THOSE SETTINGS. IF MAXIMUM DEFLECTION IS OBTAINED WITH SETTINGS A, A' AND ALSO SETTING B, USE ONLY SETTING A OR A' SINCE THESE SETTINGS WILL GIVE MINIMUM CAPACITY. SETTING B IS INCORRECT.

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SETTING B

Figure 130. Determination of the correct settings for OSC. trimmer capacitors C25, C26, and C27.

(*e*) Adjust the ANT. BAND 1 trimmer capacitor C6 (on the bottom of the chassis) for a maximum deflection on the output meter.

(3) Repeat the entire procedure from step (*d*) above of the l-f alinement to correct any errors due to interaction of adjustments. It may be necessary to repeat these operations twice. This depends on the initial degree of misalinement.

c. BAND 2 ALINEMENT.

(1) To aline the receiver at the l-f end of BAND 2, proceed as follows:

(*a*) Turn control Ⓜ to BAND 2.

(*b*) Set the signal generator at 3.6 mc.

(*c*) Set the receiver TUNING control Ⓢ to exactly 3.6 mc.

(*d*) To aline the BAND 2 coil of r-f transformer T2, carefully adjust the coil ② tuning slug screw (on the top of the receiver chassis) for a maximum deflection on the output meter.

(*e*) To aline the BAND 2 coil of ANT. transformer T1, carefully adjust the coil ② tuning slug screw (on the top of the chassis) for a maximum deflection on the output meter.

(*f*) To aline the BAND 2 coil of OSC. transformer T3, carefully adjust the coil ② tuning slug screw (on the top of the chassis) for a maximum deflection on the output meter.

(2) To aline the receiver at the h-f end of BAND 2, proceed as follows:

(*a*) Set the signal generator at 6.6 mc.

(*b*) Set the receiver TUNING dial to exactly 6.6 mc.

(*c*) Carefully adjust OSC. BAND 2 trimmer capacitor C26 (on the bottom of the chassis) for a maximum deflection on the output meter. Refer to figure 130.

(*d*) Adjust the R. F. GAIN BAND 2 trimmer capacitor C16 (on the bottom of the chassis) for a maximum deflection on the output meter.

(*e*) Adjust the ANT. BAND 2 trimmer capacitor C5 (on the bottom of the chassis) for maximum deflection on the output meter.

(3) Repeat steps (*d*) and (*e*) above of the

l-f alinement of BAND 2 to correct any errors due to interaction of adjustments.

d. Band 3 Alinement.

(1) To aline the receiver at the l-f end of BAND 3, proceed as follows:

(*a*) Turn control Ⓜ to BAND 3.

(*b*) Set the signal generator at 2 mc.

(*c*) Set the receiver TUNING control to exactly 3.6 mc.

(*d*) To aline the BAND 3 coil of r-f transformer T2, carefully adjust the coil ③ tuning slug screw (on the top of the receiver chassis) for a maximum deflection on the output meter.

(*e*) To aline the BAND 3 coil of ANT. transformer T1, carefully adjust the coil ③ tuning slug screw (on the top of the chassis) for a maximum deflection on the output meter.

(*f*) To aline the BAND 3 coil of OSC. transformer T3, carefully adjust the coil ③ tuning slug screw (on the top of the chassis) for a maximum deflection on the output meter.

(2) To aline the receiver at the h-f end of BAND 3, proceed as follows:

(*a*) Set the signal generator at 3.6 mc.

(*b*) Set the receiver TUNING dial to exactly 3.6 mc.

(*c*) Carefully adjust OSC. BAND 3 trimmer capacitor C25 (on the bottom of the receiver chassis) for a maximum deflection on the output meter (fig. 130).

(*d*) Adjust the R. F. GAIN BAND 3 trimmer capacitor C15 (on the bottom of the chassis) for a maximum deflection of the output meter.

(*e*) Adjust the ANT. BAND 3 trimmer capacitor C4 (on the bottom of the chassis) for a maximum deflection on the output meter.

(3) Repeat steps (*d*) and (*e*) above of the l-f alinement of BAND 3 to correct any errors due to interaction of adjustments.

169. Crystal Calibrator Oscillator Alinement

The adjustment of the iron slug in transformer T7 is made by the manufacturer and the necessity of its being reset is very unlikely. The position of the slug will not change the frequency output of the crystal oscillator to any extent, therefore, do not attempt to adjust the crystal oscillator output.

Section V. TRANSMITTER ALINEMENT PROCEDURES

170. Test Equipment Used for Alinement of Transmitter Section of Receiver-Transmitter RT–77/GRC–9

To aline the transmitter, use the following equipment:

a. Frequency Meter Set SCR–211–(*).

b. A voltmeter with an internal resistance of 1,000 ohms per volt or more. Correct metering socket voltages are found on the back panel of the transmitter (par. 147).

c. A power source for operation of the transmitter. A stable source should be used such as Vibrator Power Unit PE–237, although Generator GN–58 can be used if necessary.

d. Dummy antenna load of 72 ohms or 5,000 ohms noninductive resistance with a rating of 20 watts or higher.

171. Transmitter Alinement Procedure
(figs. 131 and 132)

a. Remove the power cable from the transmitter.

b. Unfasten the catches and remove the transmitter from its case. Be careful not to damage the p-a tube.

c. Attach the power cable to the power receptacle on the front of the panel.

Caution: Be careful, since the top cap of the output tube and many other points carry approximately 500 volts when the power is turned on.

d. Set switch Ⓓ to PHONE–HI.

e. Set switch Ⓕ to BAND 1–MO.

f. Turn the ANT. SELECTOR switch Ⓐ to WHIP position 4, and adjust the ANTENNA TUNING control Ⓒ to 10. Do not use any posi-

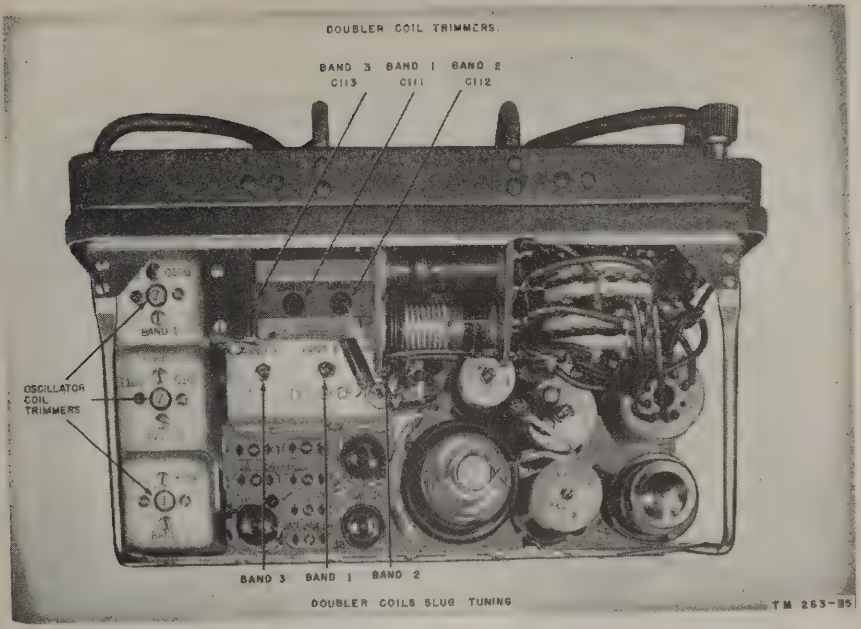

Figure 131. Transmitter alinement points, top of chassis.

tion lower than 10, since misalinement will result.

g. Set the frequency meter to 11,200 kc.

h. Set control Ⓗ (OSC. CAL. control) to midposition.

i. Set the FREQ. CONTROL Ⓘ knob on the transmitter to the setting indicated on the calibration chart for 11,200 kc.

j. Press the microphone button and listen in the phones connected to the frequency meter for the signal from the transmitter. Adjust the mo BAND 1 (MO) trimmer (C106B) to exactly zero beat. If the 200-kc crystal in the receiver is used instead of the frequency meter, proceed as instructed in paragraph 55.

Note. Since Frequency Meter SCR-211-(*) can give beat notes between harmonics of the transmitter and frequency meter, measurements of the transmitter frequency should be taken at several points on the dial to be sure that the transmitter has been alined to the correct frequency, and that it has calibrated closely over its entire range. If a check is made at several points and it is found that only the one at which the adjustment has been made is closely on frequency and that the other points checked are considerably in error, it is probable that the wrong beat note was used in the frequency meter and that none of the frequencies are correct.

k. Connect the negative lead of the 1,000-ohm per volt meter to point No. 5 on the metering socket and connect the positive lead to the chassis or pin 7, using the 100-volt scale on voltmeter.

l. Adjust the doubler trimmer (C111) BAND 1 for maximum output indication on the meter.

m. Using approximately a 3-volt scale of the meter, connect the positive lead of the meter to point No. 2 and the negative lead to point No. 8 of the metering socket.

Caution: Be careful, since both ends of the meter connected in this way are approximately 500 volts above the chassis.

n. Adjust the power amplifier trimmer (C118) BAND 1 for MINIMUM indication on the meter.

o. Set the FREQ. CONTROL Ⓘ knob on the transmitter to the setting indicated on the calibration chart for 6.6 mc. Using the 100-volt scale, connect the negative meter lead to pin 5 and the positive lead to pin 7 of the metering socket. Adjust the BAND 1 DOUBLER screw on coil T104 (core) for MAXIMUM voltage and tighten the locknut.

p. Using the 3-volt scale, connect the negative meter lead to pin 8 and the positive meter lead to pin 2 at the metering socket. Adjust BAND 1 (PA) iron core for MINIMUM voltage on the meter and tighten the locknut.

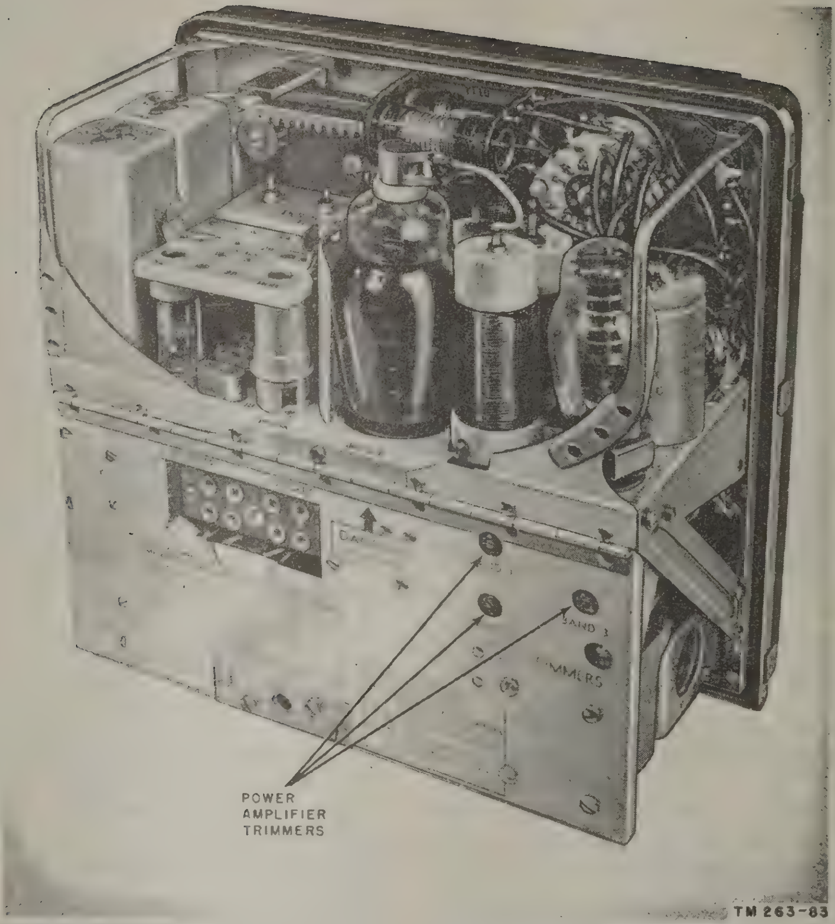

Figure 132. Transmitter alinement points, back of chassis.

q. Repeat operations as described in subparagraphs *k*, *l*, *m*, and *n* above in their proper sequence.

r. Connect the 5,000-ohm carbon resistor from the ANT. post on the transmitter to some bare metal part of the chassis of the transmitter. Turn the ANT. SELECTOR switch Ⓐ to REEL 5, 6, 7, or 8, whichever will resonate. Rotate ANTENNA TUNING knob (control Ⓒ) until INDICATOR glows brightest.

s. As a final check to insure proper alinement, the transmitter should be tuned at one end of the frequency band and then at the other. At the same time, adjust knobs Ⓐ and Ⓒ at each end of the band. This is done to make the indicator glow at normal brilliance and assures that the antenna coupling circuits can be tuned to resonance at each end of the band.

t. The alinement of the transmitter is now complete on BAND 1. The same procedure will be carried out for BANDS 2 and 3 using alinement frequencies of 6,100 kc and 3,600 kc for BAND 2 and 3,300 kc and 2,000 kc for BAND 3.

u. Remove the power cable as a safety measure.

v. Replace the transmitter in its case.

Note. Transmitter alinement without test equipment is virtually impossible. Never attempt to aline the transmitter without a voltmeter.

Section VI. FINAL TESTING OF RECEIVER SECTION

172. General

Sections VI and VII are intended as a guide to be used in determining the quality of a repaired Radio Set AN/GRC–9. The minimum test requirements outlined in paragraphs 175 through 200 may be performed by maintenance personnel with adequate test equipment and the necessary skills. Repaired equipment meeting these requirements will furnish uniformly satisfactory operation.

173. Test Equipment Required for Final Testing of Receiver Section

The instruments needed for testing the repaired equipment are listed below:

a. Signal generator with a frequency range from 2 mc to 12 mc. It should be capable of producing a signal modulated 30 percent at 400 cycles. Signal Generator I–72–(*) is suitable.

b. A vacuum-tube microvoltmeter if there is none available in the signal generator. It should be capable of reading from 0 to 500 microvolts.

c. Output meter having a range of at least 90 mw (milliwatts) and should be sensitive enough to have one midscale reading for 10 mw. It also should have a 4,000-ohm input impedance.

174. Receiver Section Preliminary Adjustments

All receiver measurements are made under the test conditions listed below, unless otherwise indicated:

Dummy antenna ___110 uuf
Standard output __10 mw or 6.3 volts in a 4,000-ohm noninductive load
Load impedance ___4,000 ohms noninductive
Power ratio ______Signal-plus-noise to noise ratio (10:1)
Modulation _______30 percent at 400 cycles
Controls Ⓞ and Ⓟ __Set at maximum

The signal generator is connected to the ANT. binding post on the transmitter through the dummy antenna specified above. The output meter should be connected to one of the PHONES jacks. Then the receiver is tuned to resonance at each of the test frequencies. The transmitter control Ⓒ is set at the approximate center of its range, and the antenna selector switch (control Ⓐ) is set to WHIP position 1.

175. Sensitivity Test

a. General. Sensitivity test input is expressed in microvolts and is the least input signal which, when modulated 30 percent at 400 cycles and fed into the receiver, will produce the standard output of 10 mw with controls Ⓞ and Ⓟ at maximum settings. The test is conducted to give a signal-plus-noise ratio of 10 to 1. The sensitivity is measured at the following test frequencies:

Band	*High*	*Medium*	*Low*
1	12 mc	9.3 mc	6.6 mc
2	6.6 mc	5.1 mc	3.6 mc
3	3.6 mc	2.8 mc	2.0 mc

b. C-W Sensitivity Test. The procedure is as follows:

(1) Turn control Ⓛ to C.W.
(2) Adjust TUNING control Ⓝ to the test frequency.
(3) Set the signal generator to the same unmodulated test frequency.
(4) Adjust the A. F. GAIN control Ⓞ and the signal generator output control until the output meter reads 10 mw.
(5) Detune the signal generator to at least 20 kc away from resonance and adjust the R. F. GAIN control Ⓟ until the output meter reads 1 mw.
(6) It is probable that when the signal generator is set again at the resonant frequency, the output meter no longer reads 10 mw. Readjust the volume controls until it has the correct reading.
(7) Repeat steps 5 and 6 above until the condition is maintained where the output meter reads 10 mw with the signal generator on resonance and 1 mw with the generator detuned, *for the same setting of receiver and signal generator volume controls.*
(8) The sensitivity is then the signal voltage input to the receiver when the out-

put meter records 10 mw after the condition in step 7 is found.

c. Phone Sensitivity Test. The procedure is as follows:

(1) Turn control Ⓛ to PHONE.
(2) Adjust TUNING control Ⓝ to the test frequency.
(3) Set the signal generator to the same test frequency, modulated 30 percent at 400 cycles.
(4) Adjust the A. F. GAIN control Ⓞ and the signal generator output control until the output meter reads 10 mw.
(5) Remove the modulation from the signal input and adjust the R. F. GAIN control Ⓟ until the output meter reads 1 mw.
(6) When the modulation is removed, the output is no longer 10 mw. Readjust the volume controls until it is 10 mw.
(7) Repeat steps 5 and 6 above until the condition is maintained where the output meter reads 10 mw with the signal generator modulated and 1 mw with the generator unmodulated, *for the same setting of receiver and generator volume controls.*
(8) The sensitivity is then the signal voltage input to the receiver when the output meter records 10 mw and when the condition in step 7 is found.

d. Sensitivity Values. For a receiver output of 10 mw at a signal-plus noise to noise ratio of 10, the sensitivity figure of the receiver should be not more than 3 microvolts for c-w reception, and not more than 10 microvolts for phone reception.

176. Selectivity Test

The selectivity test gives an indication of the shape of the bandwidth or band-pass characteristics of the tuned circuits in the receiver. The selectivity is measured at 6,600 kc (BAND 2).

a. The signal generator is set at 6,600 kc, modulated 30 percent at 400 cycles, and has an initial input of 10 microvolts.

b. Receiver volume controls Ⓞ and Ⓟ are adjusted so that a 10-mw output is indicated on the output meter. These controls are not changed for the remainder of the test.

c. The input voltage from the signal generator is successively increased to 2, 10, 100, and 1,000 times its initial value and, at each value of signal strength, the signal generator is detuned *on each side* of 6,600 kc so that the receiver will produce exactly a 10-mw output.

d. The selectivity of the receiver is within the following limits, using the above steps.

	Total bandwith (kc)	
Signal generator input	*Minimum**	*Maximum*
2 x initial setting	3.5	--
10 x initial setting	--	12
100 x initial setting	--	20
1000 x initial setting	--	30

---

*Minimum indicates that for a signal generator input of 2 x initial setting there should not be less than 3.5 kc between the two points (on either side of 6,600 kc) at which the power output will be equal to the 10-mw prevailing at the initial input of 10 microvolts.

177. Image Frequency Rejection Ratio

This is defined as the ratio of signal input voltage at the image frequency to the signal input voltage required at the desired frequency, with the receiver power output being the same for both frequencies. The image frequency rejection ratios for the receiver should be—

Band	*Ratio*
1	Greater than 50 to 1
2	Greater than 250 to 1
3	Greater than 1000 to 1

The image frequency rejection ratio is determined at the high, middle, and low end of each band. Proceed as follows:

a. Set the output voltage of the signal generator at 10 microvolts with a 400-cycle signal modulated 30 percent.

b. The receiver volume controls are adjusted to produce a 10-mw output indication on the output meter.

c. Tune the signal generator to the image frequency of the resonant frequency to which the receiver TUNING control Ⓝ is set. The image frequency is 912 kc plus the resonant frequency. Image ratio is obtained by dividing the microvolts necessary to produce a 10-mw output at image frequency (912 kc plus resonant frequency) by the microvolts required for the same 10-mw output at the resonant frequency, the volume control being in the same position for the two measurements.

178. I-f Rejection Ratio

The i-f rejection ratio should be greater than 100 db at all frequencies within the 2 mc to 12 mc bandwidth of the receiver. It is measured at the low end of each band, 2 mc, 3.6 mc, and 6.6 mc. The input voltage of the signal generator is 10 microvolts at resonance. The receiver volume controls are adjusted to produce 10-mw output. The ratio is obtained by dividing the microvolts, necessary to produce 10-mw output at the i.f. (456 kc), by the microvolts required for the same output at the resonant frequency, the receiver volume controls being in the same position for the two measurements.

179. A-f Output

a. The maximum power output of the receiver should not be less than 90 mw at all frequencies from 250 to 2,500 cps (cycles per second) for both 250- and 4,000-ohm output impedances. Also, for these impedances, the maximum undistorted output (less than 10 percent distortion) should be not less than 75 mw at all frequencies from 250 to 2,500 cps.

b. The input level of the test signal is set to 500 microvolts at 5,100 kc modulated at 30 percent, and the receiver is tuned to resonance. The af is varied, and receiver volume control Ⓞ is adjusted to maximum undistorted output at each af. Maximum undistorted power output is defined as the maximum power output which contains less than 10 percent total harmonic distortion (root-mean-square voltage).

180. Audio Fidelity

a. With both 250- and 4,000-ohm output impedances, the maximum undistorted output at all frequencies from 250 to 2,500 cps should be within +2 db or –5 db (decibel) of the output at 400 cps.

b. The input level of the test signal is set to 500 microvolts at 6,600 kc (BAND 2) and modulated at 30 percent at 400 cps. The receiver is tuned to 6,600 kc and the receiver volume controls are set to produce an output meter reading of 10 mw. The volume controls should not be touched for the remainder of the test. The a-m frequency is varied, while the modulation remains at 30 percent for all modulation frequencies.

181. Calibration Accuracy

a. The dial calibration should be accurate to within 30 kc on BANDS 2 and 3 and 50 kc on BAND 1.

b. The calibration accuracy of the receiver is checked at 200-kc intervals over the entire frequency range of each band, starting at 2,000 kc. The dial is turned in the direction of the increasing frequency for each check point.

c. See paragraph 50 for calibration operation.

182. Crystal Calibrator Circuit

a. With the receiver set to CAL. and the volume controls set at maximum, the power output of the receiver is measured at each crystal check point as the receiver is tuned through the entire frequency range. The power output indicated by the output meter should be a minimum of 10 mw.

b. The crystal calibrator oscillator circuit should have an accuracy of plus or minus 20 cps at 200 kc when using standard Crystal Unit CR–2/U which is calibrated to plus or minus 18 cps.

c. The spurious response should have a rejection ratio of more than 27 db compared to the crystal check points on either side of the particular spurious response. With the receiver set to CAL. and volume controls set to maximum, the receiver is tuned over the entire range and spurious responses are noted. The receiver is tuned to the weaker of the crystal check points on either side of each spurious response, and the R. F. GAIN control Ⓟ is reduced so that the receiver output is 50 mw. The receiver then is tuned to the spurious response without disturbance of the volume control. The spurious response power output reading should be less than .1 mw.

183. Beat Frequency Oscillator

The bfo is checked at 6,600 kc (BAND 2). The volume controls are adjusted to produce an output of 50 mw at a signal input of 500 microvolts when left in this position. Using Headset HS–30–(*), the audible beat note is distinct, without slurring as the signal input voltage is increased to 500 millivolts.

184. Resettability

The resettability is a measure of the backlash in the tuning gears. The resettability is checked at the h-f end of each band. Each test frequency is approached from the clockwise and counter clockwise directions, and the difference in readings is recorded. There should not be more than 5 kc difference in the dial reading when the test frequency is approached from the clockwise and counterclockwise directions.

185. Spurious Responses

Spurious responses caused by harmonics of the h-f oscillator and bfo should have a rejection ratio of more than 50 db over the entire tuning range. Spurious responses are measured at the h-f end of each band. With 10 microvolts input at the receiver signal frequency, the volume control is adjusted to give a 10-mw output. The input is then adjusted to 10,000 microvolts, and the signal generator frequency is adjusted over the frequency range of plus or minus 2 mc of the test frequencies. If spurious responses are encountered, the input should be reduced to give an output of 10-mw. The voltage ratio of this input to the resonant frequency input is recorded as the spurious response ratio.

186. Current Drain

The receiver current drain is measured with the receiver set for c-w operation, using a 0- to 50-ma meter in series with the B supply and a 0- to 1-ampere meter in series with the A supply. At 105 volts and 1.4 volts input, the B drain should be less than 20 ma and the A drain should be less than 500 ma, respectively, under conditions of maximum current consumption.

187. Sidetone

The receiver should provide clear monitoring when the transmitter is operating on C.W. or MCW or PHONE. With the SIDE TONE VOL. control ⓒ set at maximum, the sidetone output at the receiver jack should be a minimum of 10 mw.

188. Receiver Section Tests at Reduced D-c Supply Voltage Input

a. Sensitivity. With a 1.2-volt filament voltage, a plate voltage of 75 volts and an output of 10 mw, the sensitivity should be not less than 50 microvolts for voice reception and not less than 25 microvolts for c-w reception.

b. Calibrator Output. The crystal calibrator output under l-v conditions are measured by use of headphones at the receiver output jacks. With 1.2 volts filament voltage and a plate voltage of 75 volts, the calibrator output should be audible over the frequency range within two consecutive crystal check points.

c. Filament Voltage Regulation. The filament voltage is measured at a tube socket when operating the filaments through a 10.6-ohm dropping resistor in series with a 6-volt source and an 8-volt source in turn. The filament voltage should be greater than 1.2 volts for a 6-volt source and less than 1.7 volts for an 8-volt source.

Section VII. FINAL TESTING OF TRANSMITTER SECTION

189. Test Equipment Required for Final Testing Transmitter Section

The instruments needed for final testing of the transmitter are listed below:

R-f meter	0 to 2 amperes
D-c voltmeter	20,000 ohms per volt
Oscilloscope	BC–1060–(*)
Test Set	TS–505/U
Frequency Meter	SCR–211–(*)

190. Transmitter Section, Preliminary Adjustments

Unless otherwise specified, all transmitter measurements are made under the following test conditions:

a. Dummy antenna: Use a 20-ohm noninductive resistor in series with a 70-uuf capacitor and 0- to 2-ampere r-f meter. This is equivalent to a 15-foot whip antenna. Connect the meter end to the chassis or ground side.

Note. A 5,400-ohm noninductive resistor is equivalent to a half-wave antenna (control Ⓐ in REEL position).

b. Control Ⓑ is set to PHONE–HI position unless otherwise stated.

191. Power Output

With input voltages of 6.3 volts filament and 500 and 425 plate voltages at the POWER receptacle, the power outputs should not be less than those listed in the table below. The ANTENNA TUNING control Ⓒ is adjusted to maximum meter deflection for each frequency. The power output is: (ANTENNA CURRENT)^2 (20 ohms). The input power to the transmitter is obtained by measuring the total d-c plate and screen currents of the p-a tube. The input power to the transmitter should be less than the input powers listed in the following table.

Operating voltages	Plate and screen input power (watts)	Position of control Ⓓ		Power output (watts)	Frequency (kc)	Frequency band
500	100	CW	HI	7	2,000	3
500	80	PHONE	HI	2	2,000	3
500	70	CW	LO	3	2,000	3
500	50	PHONE	LO	.3	2,000	3
500	100	CW	HI	12	3,600	3
500	80	PHONE	HI	3	3,600	3
500	100	CW	HI	10	3,600	2
500	80	PHONE	HI	3.5	3,600	2
500	100	CW	HI	12	6,600	2
500	80	PHONE	HI	3	6,600	2
500	100	CW	HI	7.5	6,600	1
500	80	PHONE	HI	3	6,600	1
500	100	CW	HI	12	12,000	1
500	80	PHONE	HI	5	12,000	1
425	60	CW	LO	2	2,000	3
425	40	PHONE	LO	.2	2,000	3

192. Microphone Input Voltage

In phone operation for audio-modulation frequencies between 250 and 3,000 cps, 100 percent modulation should be obtained for an input of less than .5 volt to the primary of microphone transformer T112.

193. Mcw Operation

a. The frequency of the modulating tone in mcw operation should be between 600 and 850 cps. The transmitter should be modulated from 70 to 100 percent.

b. The transmitter is set up for normal operation and the sidetone control is adjusted for maximum output. The percentage of modulation, as viewed on an oscilloscope, is checked for both high and low power mcw operation at 8 mc.

194. Netting Operation

a. At all frequencies in the range of the transmitter, it should be capable of netting with another radio transmitter within plus or minus 1,000 cps.

b. The transmitter is set up for high-power, mo, and c-w operation (HI–MO–CW). The receiver of the radio set is zero-beat to a frequency meter adjusted to 12 mc. The transmitter then is adjusted to zero beat with the receiver in the NET position. Then the transmitter is set to normal c-w operation and the frequency of the beat note in the frequency meter should be checked.

195. Overload Relay K102

a. The overload relay in the p-a circuit should open during crystal operation when mistuning of FREQ. CONTROL Ⓘ exceeds 7 percent of the operating frequency. The overload relay should cut out before the grid voltage drops below 10 volts.

b. The transmitter is set up for CW–HI–XTAL operation for frequencies in the middle of each band. The transmitter tuning dial is set to the crystal frequency, and is tuned above and below until the overload relay opens. The dial readings and the p-a grid voltage should be recorded.

196. Metering Socket Readings

a. The transmitter is set for high-power, mo, and c-w operation with a 20-ohm, 70-uuf dummy antenna load on the antenna circuit. The plate supply should be adjusted to 500 volts and the filament supply to 6.3 volts. The antenna circuit should be resonated, and the voltages at the metering socket should be recorded for c-w operation. The measurements are made by using a 20,000-ohm per volt d-c meter. Plate current (with no load) measurements are made with the dummy antenna removed.

b. The following readings should be obtained:

Metering socket pins		Circuit	Value
1+	7—	P.A. filament voltage	+6.3 volts
2+	7—	P.A. plate voltage	+500 volts
2—	8—	P.A. plate current (loaded)	BANDS 1, 2, and 3, 110 ma; maximum
		P.A. plate current (unloaded)	Less than 30 ma on all bands
3+	7—	P.A. screen grid voltage	275 volts maximum on all bands
4+	7—	P.A. suppressor grid bias-CW	+6.3 volts
4—	7+	P.A. suppressor grid bias-PHONE	—40 volts
5—	7+	P.A. signal grid bias	—45 to —70 volts
6+	7—	Master oscillator plate voltage Modulator plate voltage	+105 volts
7+	7+	Terminal 7 is grounded to the transmitter chassis	0 volt

197. Keying

It should be possible to key the transmitter at speeds up to 25 words per minute either in the MO or XTAL position of control Ⓕ.

198. Frequency Stability Versus Input Voltage

a. The transmitter is connected to the dummy antenna and is fully loaded for high-power c-w operation.

b. The transmitter is tuned to 12,000 kc and is allowed to warm up for 5 minutes at input voltages of 5.4 and 400 volts. The frequency is checked by a frequency meter and the transmitter is set to zero beat with the frequency meter. The supply voltages are increased to 7.5 and 700 volts. The frequency meter is then zero-beat to the transmitter. The difference in readings is considered the drift.

c. The frequency drift of the mo should not exceed .02 percent for a variation from 5.4 volts filament and 400 volts plate to 7.5 volts filament and 700 volts plate.

199. Vibrator Power Unit PE–237, Voltage Output Test

With a 6-, 12-, or 24-volt vehicular battery connected to the input of the power unit, the voltage outputs are as follows:

Terminals		*Circuit*	*Value in volts*
20	24	Transmitter filaments	6.3
21	24	Receiver plates (SEND)	105
22	24	Receiver filaments (SEND)	1.35
23	24	Receiver filaments (SEND)	1.35
32	24	Transmitter plates	500
33	24	Receiver plates (STANDBY)	100
34	24	Keying relay K101	6.0

These measurements are made with the power unit loaded. Refer to paragraph 155*c* for measurement disassembly.

200. Generator GN–58–(*), Voltage Output Test

With the hand generator being driven at approximately 60 rpm, the voltage outputs should be the same as those given in the VOLTAGE CHART on the main schematic diagram (fig. 137). Refer to paragraph 151 for disassembly of the generator so that it may be checked under load.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

201. General

The instructions for repacking equipment for shipment or limited storage are contained in paragraph 202. Follow these instructions when performing repacking procedures.

202. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on the material available and the conditions under which the equipment is to be shipped or stored.

b. Whenever practicable, place a dehydrating agent such as silica gel inside the chests. Protect the chests with a waterproof paper barrier. Seal the seams of the paper barrier with waterproof sealing compound or tape. Pack the protected chests in a padded wooden case, providing at least 3 inches of excelsior padding or some similar material between the paper barrier and the packing case.

c. Be sure to place the components in their proper carrying bags. Refer to figures 5, 7, and 8 for the contents of each carrying bag.

Section II. DEMOLITION OF MATÉRIEL TO PREVENT ENEMY USE

203. General

The demolition procedure outlined in paragraph 204 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

204. Methods of Destruction

When ordered by the commander, demolish this equipment in order to prevent the enemy from using or salvaging it. However, act only upon orders from the commander. Proceed as follows:

a. SMASH. Smash the crystals, controls, tubes, coils, switches, capacitors, transformer, and headsets, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. CUT. Cut cords, headsets, and wiring, using axes, handaxes, or machetes.

c. BURN. Burn cords, resistors, capacitors, coils, wiring, and technical manuals, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. BEND. Bend panels, cabinet, and chassis.

e. EXPLOSIVES. If explosives are necessary, use firearms, grenades, or TNT.

f. DISPOSAL. Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

g. DESTROY EVERYTHING.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3 and SR 310–20–4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps supply catalogs.

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1. Army Regulations

AR 380–5	Safeguarding Military Information.

2. Supply Publications

SIG 1	Introduction and Index.
SIG 3	List of Items for Troop Issue.
SIG 5	Stock List of All Items.
SB 11–6	Dry Battery Supply Data.
SB 11–47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

3. Technical Manuals on Auxiliary Equipment and Test Equipment

TM 11–5527 (TO 16–35TS352–3)	Multimeter TS–352/U.
TM 11–300	Frequency Meter Sets SCR–211–(*).
TM 11–303	Test Sets I–56–C, –D, –H, and –J.
TM 11–307	Signal Generators I–72–G, H, J, and K.
TM 11–321	Test Set I–56–E.
TM 11–472	Repair and Calibration of Electrical Measuring Instruments.
TM 11–971	Power Unit PE–162–B.
TM 11–2613	Voltohmmeter I–166.
TM 11–2626	Test Unit I–176.
TM 11–2627	Tube Tester I–177.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TM 9–2851	Painting Instructions for Field Use.

5. Camouflage

FM 5–20	Camouflage, Basic Principles.

6. Decontamination

TM 3–220	Decontamination.

7. Demolition

FM 5–25	Explosives and Demolitions.

8. Packaging and Packing Instructions

a. JOINT ARMY-NAVY PACKAGING SPECIFICATIONS.

JAN–D–169	Desiccants (activated).
JAN–P–100	Packaging and packing for overseas shipment—general specifications.
JAN–P–106A	Packaging and packing for overseas shipment—Boxes, wood, nailed.
JAN–P–116	Packaging and packing for overseas shipment—Preservation, methods of.
JAN–P–125	Packaging and packing for overseas shipment—Barrier-materials, waterproof, flexible.
JAN–P–131	Packaging and packing for overseas shipment—Barrier material; moisture- vaporproof, flexible.

b. U. S. ARMY SPECIFICATION.

100–2E	Marking shipments by contractors (and Signal Corps Supplement thereto).

c. SIGNAL CORPS INSTRUCTIONS.

720–7	Standard Pack.
726–15	Marking of Interior Containers.

9. Other Publications

FM 24–18	Field Radio Techniques.
FM 72–20	Jungle Warfare.
SR 310–20–3	Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications, and Combined Communications Board Publications).
SR 310–20–4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, Tables of Equipment, and Tables of Basic Allowances.
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 5	Defense Against Radio Jamming.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TM 1–455	Electrical Fundamentals.
TM 9–2857	Storage Batteries Lead-Acid Type.
TM 11–310	Schematic Diagrams for Maintenance of Ground Radio Communication Sets.
TM 11–314	Antennas and Antenna Systems.
TM 11–415	Dry Batteries.
TM 11–430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11–453	Shop Work.
TM 11–455	Radio Fundamentals.
TM 11–466	Radar Electronic Fundamentals.
TM 11–483	Suppression of Radio Noises.
TM 11–486	Electrical Communication Systems Engineering.

TM 11–496	Training Text and Applicatory Exercises for Amplitude-Modulated Radio Sets.
TM 11–660	Introduction to Electronics.
TM 11–4000	Trouble Shooting and Repair of Radio Equipment.
TM 38–650	Basic Maintenance Manual.

10. Abbreviations

a-c	alternating-current
a-f	audio-frequency
a-m	amplitude-modulated
avc	automatic volume control
bfo	beat-frequency oscillator
cps	cycles per second
c-w	continuous-wave
db	decibel
d-c	direct-current
f-m	frequency-modulated
h-f	high-frequency
h-v	high-voltage
i-f	intermediate-frequency
kc	kilocycle
l-f	low-frequency
l-v	low-voltage
ma	milliampere
mc	megacycle
mcw	modulated continuous wave
meg	megohm
mo	master oscillator
mw	milliwatt
p-a	power-amplifier
r-f	radio-frequency
rpm	revolutions per minute
uf	microfarad
uuf	micromicrofarad
VTVM	vacuum-tube voltmeter

APPENDIX II

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisition must cite an authorized basis, such as T/O & E, T/A, T/BA, SIG 7–8–10, SIG 10, list of allowances of expendable material or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7&8–AN/GRC–9. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

2. Identification Table of Parts for Radio Set AN/GRC–9

Notes. 1. Asterisks in column 1 indicate parts procured on orders No. 53906–P–45–05 and 53906–P–45.

2. Asterisks in column 2 indicate parts procured on orders No. 9157–P–46–02, 9157–P–46, and 10250–P–49.

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	RADIO SET AN/GRC–9: portable; field station or vehicular; AM, CW, and MCW; 25 w on CW, 8.5 w on phone max; Sig C spec 271–3213.	Receives and transmits r-f signals.	2S2501–9
	*	*	TECHNICAL MANUAL (TM 11–263).	------------------------------	(Order through AGO channels)
	*	*	ANTENNA AT–101/GRC–9; Sig C Wire W–120 w/10 ins spaced throughout lg; 107½ ft lg; 8 radiating sect; provision for shorting across ins to obtain various lg; Sig C spec 271–3213.	For permanent or semipermanent installation of Receiver - Transmitter RT–77/GRC–9.	2A203–101
	*	*	ANTENNA AT–102/GRC–9; Sig C Wire W–120 w/10 ins spaced throughout lg; 137½ ft lg; 9 radiating sect; w/provision for shorting across ins to obtain various lg; Sig C spec 271–3213.	For permanent or semipermanent installation of Receiver - Transmitter RT–77/GRC–9.	2A203–102
	*	*	BAG BG–172: general purpose; canvas; approx 16" lg x 14" h x 9" wd o/a; Sig C spec VT–276, CCC–D–771, CCC–T–191.	Used to carry equipment accessories.	2Z551–172
	*	*	BAG BG–175: generator; wp canvas; 6" x 8" x 13" w/2" strap.	For carrying Generator GN–58–(*).	3H160–175
	*	*	BAG CW–140/GRC–9: radio set; canvas; approx 14" lg x 14" wd x 16" d; 1 interior side pocket; 2 shoulder straps; Sig C spec 271–3213.	For carrying Receiver-Transmitter RT–77/GRC–9.	2Z553–140
	*	*	BATTERY BA–48: dry; 1½ v "A" 90 v "B"; 9$^{15}/_{16}$" lg x 2¼" wd x 4⅞" h; w/4 cont socket term on top.	Supplies power to receiver section of Receiver-Transmitter RT–77/GRC–9.	3A48

2. Identification Table of Parts for Radio Set AN/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	BOX BX–53: for tubes and lamps; metal; 6" wd x 6½" lg x 2½" h o/a; 4 compartments.	Carries spare receiver-transmitter tubes and panel lamps.	6F153
			BRACKET FT–515: ins mtg; metal 6½" lg x 1¼" wd x ⅛" thk o/a.	Used with Insulator IN–127 for installation of the whip antenna.	2Z1203–515
	*	*	CABLE ASSEMBLY, power: Sig C Cord CD–1086; rubber jacketed; round, .562" diam; 44" lg; 8 stranded cond, 6 #20 AWG, 2 #14 AWG; w/9 cont male connector 1 end, 9 cont female connector other end.	Connects Vibrator Power Unit PE–237 to Receiver-Transmitter RT–77/GRC–9.	3E1999–86–3.8
	*	*	CABLE ASSEMBLY, power: Sig C Cord CD-1086; rubber jacketed; round, .562" diam; 7 ft lg; 8 stranded cond; 6 #20 AWG; 2 #14 AWG; w/9 cont male connector 1 end, 9 cont female connector other end.	Connects Generator GN–58–(*) to Receiver-Transmitter RT–77/GRC–9.	3E1999–86
	*	*	CABLE ASSEMBLY, power: Sig C Cord CD–1119; rubber jacketed; round, 5/16" diam; 34½" lg; 3 #18 AWG stranded cond; w/4 prong male connector 1 end, 4 prong female connector other end.	Connects Battery BA–48 to the POWER receptacle on Receiver-Transmitter RT–77/GRC–9.	3E1999–119
	*	*	CONNECTOR, female contact: Sig C Plug PL–257; 4 round pol cont; straight; 1 11/32" lg x 1 1/16" diam; Amphenol #AN–3106–14S–2S.	Part of Cord CD–1119	2Z7226–P257
	*	*	CONNECTOR, female contact: Sig C Plug PL–279; 9 round pol cont; 90 deg angle type; 2⅝" lg x 2" diam o/a.	Part of Cord CD–1086	2Z7226–279
	*	*	CONNECTOR, male contact: Sig C Plug PL–294– 9 round pol cont; 90 deg angle type; 2" diam x 2⅝" lg o/a.	Part of Cord CD–1086	2Z7226–294
	*	*	COUNTERPOISE CP–12: radial type; 4 #19 AWG stranded cond; w/rubber compound insulation; 25 ft lg; 1 RC lead in wire 11 ft lg; w/junction strip 1 end; Sig C dwg #SC–D–1038, group 1.	Makes antenna system independent of ground characteristics.	2A712
	*	*	COUNTERPOISE CP–13: radial type; 4 #19 AWG stranded cond; w/rubber compound insulation; 25 ft lg; 1 RC lead in wire 11 ft lg; Sig C dwg #SC–D–1038.	Makes antenna system independent of ground characteristics.	2A713
	*	*	CRANK GC–7: hand; gen; steel; arm 6" lg; drive end ⅜" sq x 1 3/32" lg; handle end 3⅛" lg; wooden handle 1⅛" OD x 3" lg; Sig C dwg #RL–D–6313G, group 2.	Used with Generator GN–58–(*).	3H1407

2. Identification Table of Parts for Radio Set AN/GRC–9—Continued

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	GENERATOR GN–58: DC; output 425 v at 115 ma, 105 v at .035 amp, 6.3 v at 2.45 amp, 1.4 v at .45 amp, closed; 11" lg x 8" wd x 8¼" h o/a; handcranked; contains Socket SO–141; uses Legs LG–2, LG–3 and Crank GC–7; Sig C spec 71–3017.	Supplies power to receiver-transmitter for field use.	3H2358
	*	*	GROMMET: rubber; round; 1" diam x $\frac{5}{16}$" thk; Atlan India Rub #JG–0042; (p/o Mounting MT–350/GRC–9).	For vehicular installation of receiver-transmitter.	6Z4856–35
	*	*	GUY GY–12: antenna; treated linen yarn; 20 ft lg; Twine RP–11; incl ins, plain hook, "S" hook, and ring; Sig C dwg #SC–D–1072.	Used with mast sections MS–116, MS–117, and MS–118.	2A1312
	*	*	GUY GY–42: antenna; treated linen yarn; two 20 ft lg; Twine RP–11; incl 2 ins, collar clamp, 2 "S" hooks, 2 plain hooks, and ring; Sig C dwg #SC–D–1072.	Used with mast sections MS–116, MS–117, and MS–118.	2A1336–42
	*	*	HALYARD M–378: #4 braided white cotton line; w/ins, 18" lg of rope and snap ins fastener 1 end; lead wt other end; 80 ft lg o/a; Sig C spec 271–1606.	For hanging horizontal antenna.	6Z4938
	*	*	HALYARD M–379: #4 braided white cotton line; w/ins, 6" lg of rope and snap fastener 1 end; 10½ ft lg o/a; Sig S spec 271–1606.	For hanging horizontal antenna.	6Z49439
	*	*	INSULATOR IN–127: standoff; round post, conical at 1 end; phenolic; 13" lg x 2¾" max OD.	Supports vertical whip antenna.	3G627
	*	*	INSULATOR, strain: round post; steatite; 2¾" lg x ½" diam; Genceraco #1419–00.	Used with long-wire antenna.	3G1250–44.1
	*	*	KEY J–45: telegraph; manual; 5⅝" lg x 4½" wd x 6" h o/a; incl knee clamp, 60" lg Cord CD–201 and Plug PL–5; Sig C dwg #SC–D–10594.	Used with c-w transmission.	3Z3445
	*	*	LEG LG–2–B: detachable; rectangular metal tube 31⅞" lg x 1⅜" wd x ¾" thk; w/folding seat mtd in middle, circular shoe plate 1 end; Sig C dwg #RL–D–6006.	Used with Generator GN–58–(*).	2Z6102B
	*	*	LEG LG–3–B: detachable; round metal tube; 22$\frac{11}{32}$" lg x ¾" diam; w/circular shoe plate 1 end; Sig C spec 71–513.	Used with Generator GN–58–(*).	2Z6103B
	*	*	MAST BASE MP–65: antenna; flexible metal shaft w/ceramic ins; 16½" lg x 3" diam; Sig C dwg #SC–D–12519–A and #SC–D–12520–A.	Used to support whip antenna for vehicular installation.	2A2088–65

2. Identification Table of Parts for Radio Set AN/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	MAST SECTION MS–116: antenna; metal tubing; 39½" lg x ⅜" diam; Sig C dwg #SC–D–12521.	Part of whip antenna	2A2416
	*	*	MAST SECTION MS–117: antenna; metal tubing; ¼" to ⅜" diam x 39½" lg; Sig C dwg #SC–D–12521.	Part of whip antenna	2A2417
	*	*	MAST SECTION MS–118: antenna; metal tubing; ⅛" to ¼" diam x 39½" lg; w/corona ball; Sig C dwg #SC–D–12521.	Part of whip antenna	2A2418
	*	*	MOUNTING MT–350/GRC–9: vibration; metal; 17½" lg x 12½" wd x 1⅝" d.	Vehicular mounting for Receiver-Transmitter RT–77/GRC–9.	2Z6763–350
	*	*	PANEL COVER CW–109/GRC–9: metal; 11½" wd x 16½" lg x 3¼" d o/a.	Cover for receiver-transmitter cabinet.	2Z3350–109
	*	*	RECEIVER-TRANSMITTER RT–77/GRC–9: radio; vehicular, transportable; AM, CW, MCW; 2–12 mc in 3 bands; receiver input .5 amp, 1.4 v, .023 amp, 105 v; transmitter input 500 v, 115 ma, 6.3 v, 2.45 amp; output 25 w, CW; 8.5 w phone; mtd in metal case 16½" lg x 12½" d x 8" h o/a; Sig C spec 271–3213.	Receives and transmits voice, mcw, and c-w signals.	2C5130–77
	*	*	REEL RL–28: guy; metal; flat stamping #14 ga; 6½" lg x 2¾" wd x .0747" thk; Sig C dwg #SC–D–1064.	Used to store Guys GY–12 and GY–42.	2A3128
	*	*	REEL RL–29: antenna; metal; 11⅝" lg x 7$^{15}/_{16}$" wd x $^{27}/_{32}$" thk; Sig C dwg #SC–D–1040.	Used for storing counterpoise.	2A3129
	*	*	ROLL BG–174: antenna; canvas; approx 40" lg x 30" wd opened; Sig C spec VT–276, CCC–D–771, CCC–T–191.	For carrying mast sections and miscellaneous parts.	2Z8060–174
	*	*	SPEAKER, dynamic: Sig C Loudspeaker LS–7; 4" diam cone; PM; matching transformer 4000 ohms input impedance; o/a dimen 4⅝" h x 4⅝" wd x 2⅝" d; Sig C dwg #SC–D–7968.	Part of Loudspeaker LS–7	2Z6310–7
	*	*	STAKE GP–27: guy; metal; 7½" lg x $^{5}/_{16}$" diam w/head $^{11}/_{16}$" diam x ⅝" h; Sig C dwg #SC–D–1063.	Used with Guys GY–12 and GY–42.	2A3327
	*	*	STRAP, mounting: cotton webbing; 5¾" lg x ⅝" wd x ⅛" thk o/a; w/buckle 1 end; Rauland part/dwg #JZ–0019.	Part of Mounting MT–350/GRC–9.	6Z8470–1
	*	*	STRAP, mounting: cotton webbing; 9½" lg x 1" wd x ⅛" thk; w/buckle 1 end; Rauland part/dwg #JZ–0018.	Part of Mounting MT–350/GRC–9.	6Z8470

2. Identification Table of Parts for Radio Set AN/GRC-9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	VIBRATOR POWER UNIT PE-237: nonsynchronous; output 525 v DC, 95 ma; 105 v DC, 42 ma, 6.5 v DC, 2 amp, 6 v DC, 500 ma; 100 v DC, 17 ma and 2 output circuits 1.35 v DC, 450 ma; input 6 v DC, 36 amp, 12 v DC, 17 amp or 24 v DC, 9.5 amp; $20\frac{3}{16}$" lg x 11" wd x $9\frac{15}{16}$" d; Sig C spec 71-1606.	Supplies power to Receiver-Transmitter RT-77/GRC-9 for vehicular operation.	3H6800-237
	*	*	WIRE W-128: ins; copper; single #14 AWG stranded; .350" OD; rubber jacket; Sig C spec 71-726; (connects antennas to transmitter).	Antenna or ground lead-in wire.	1B128
			ADDITIONS		
			CABLE ASSEMBLY, power: Sig C Cord CD-201; c/o Sig C Cordage CO-144 w/Sig C Plug PL-55 on 1 end and Sig C Terminal TM-29 other end; 5 ft lg.	Used with Key J-45 -------	3E1201
			CABLE ASSEMBLY, special purpose: 9 #22 AWG cord c/o 7 strands #30 AWG ea cord; polyvinyl ins; 600 v; 4 cord in 1 vinylite jacket and 5 cords in 1 vinylite jacket; $\frac{5}{16}$" OD; Rauland term board #VT-0209 w/clamp Rauland #AG-2638 on ea end; $23\frac{1}{8}$" lg; Rauland part/dwg #VW-0385.	Connects transmitter to receiver.	3E7173-22
			SPEAKER, dynamic: 4" diam cone; PM field; voice coil impedance 3.2 ohms; $4\frac{1}{8}$" h x $2\frac{1}{4}$" d o/a; p/o Sig C Loudspeaker LS-7; Lewyt part/dwg #B-7411.	Used with Loudspeaker LS-7.	6C43-36
			TRANSFORMER, AF: plate coupling type; output pri 4000 ohms, secd 3.2 ohms; $2\frac{1}{2}$" lg x $1\frac{5}{16}$" h x $1\frac{5}{16}$" d approx; input .25 w; freq response 200-4000 cyc ±1 db; Lewyt part/dwg #A-7560.	Part of Loudspeaker LS-7--	2Z9632.515
			INSTALLATION UNIT		
	*	*	INSTALLATION UNIT FOR RADIO SET AN/GRC-9.	------------------------------	2S2501-9/50
	*	*	CORD CD-307: headset; stranded copper cond; RC; 65" lg; w/Sig C Jack JK-26 for 2 cond telephone plug 1 end; Sig C Plug PL-55, 2 cond telephone plug other end; Sig C spec #71-1105.	Headset extension ---------	3E1307-5.5

2. Identification Table of Parts for Radio Set AN/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	CORD CD–318: microphone; c/o 2 RC cords w/Sig C Switch SW–141; 1 cord 2 #20 AWG stranded cond, 8" lg one cord 3 #18 AWG stranded cond, 7 ft lg; adj strap attached to switch; Sig C Plug PL–68, 3 cond telephone plug on 7 ft cord; Sig C Jack JK–55 for 2 cond telephone plug on 8" cord; Sig C dwg #SC–D–14639 and #SC–D–14640.	Used with microphone	3E1318
	*	*	CORD CD–604: headset; 2 tinsel cond; RC; 6" lg; w/Sig C Transformer C–410 one end; Sig C Plug PL–54, 2 cond telephone plug other end; Sig C dwg #SC–D–338.	Used with Headset HS–30–(*).	3E1604
	*	*	HEADSET HS–30: radio and telephone; magnetic; impedance approx 250 ohms; 2 receivers .90" diam x .68" h; headband 6⅛" max wd; w/cord and 2 Sig C Insert M–300; Sig C spec 271–1518.	Used with Receiver-Transmitter RT–77/GRC–9.	2B830
	*	*	MICROPHONE T–17: carbon; hand type; approx 7" lg x 2½" wd x 2½" d; w/push-to-talk sw, Sig C Cord CD–76, and Plug PL–68; Sig C spec 71–819.	Used with Receiver-Transmitter RT–77/GRC–9.	2B1617
	*	*	MICROPHONE T–45: carbon: lip type; 2¼" wd x 2" h x 1⅛" d o/a; mts by ear straps; Sig C spec 71–1603.	Used with Receiver-Transmitter RT–77/GRC–9.	2B1645
	*	*	MICROPHONE COVER CW–110/U: "Fortisan" material approx 2¾" diam.		2B250–110
	*	*	SHIELD, breath: microphone; spring steel; approx ⅜" wd x 9/32" h x 13/32" d; Sig C dwg #SC–D–9974, item 3.	Used with Microphone T–45.	2B1589/1

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9

Notes. 1. Those parts having asterisks in column 1 are procured on order No. 53906–P–45–08.

2. Those parts having asterisks in column 2 are procured on orders No. 9157–P–46–02 and 10250–P–49.

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col 2			
			RECEIVER-TRANSMITTER RT–77/GRC–9: radio; vehicular, transportable; AM, CW, and MCW; 2 to 12 mc in 3 bands; receiver input .5 amp, 1.4 v; .023 amp, 105 v; transmitter input 500 v, 115 ma; 6.3 v, 2.45 amp; out-	Receives and transmits voice and c-w signals.	2C5130–77

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			put 25 w, CW– 8.5 w phone; mtd in metal case; 16½" lg x 12½" d x 8" h o/a; Sig C spec 271–3213.		
			TECHNICAL MANUAL (TM 11–263).	----------------------------	(Order through AGO channels)
			CASE GROUP		
	*	------	CABLE ASSEMBLY, power: 4 #22 and 5 #22 stranded cond; black vinylite outer jacket; round, 5/16" OD; 22⅝" lg; term board w/9 male banana plugs on ea end; Rauland part/dwg #VW–0385.	Connects transmitter to receiver.	3E7173–22
J102	*	*	CONNECTOR, male contact: 9 banana type pol cont; straight; 1.9" sq x 17/32" d, less cont; Rauland part/dwg #SM–0149; (power connector in case).	POWER plug on transmitter panel.	2Z3029–23
	*	*	FASTENER, latch: case; steel; 3 3/16" lg x 1" wd x 1" thk o/a; Rauland part/dwg #VG–2045.	Fastens case cover to case--	6Z3810–82
	*	*	GASKET: cover to case seal; channel type; rubber; 16⅓" diam x .24" thk wall; Atlan India Rub #X–301.	Seals cover and case against water.	2Z4868.444 2Z6820.116
	*	------	MOUNTING, male connector: aluminum; 4⅜" lg x 13/32" wd x ½" d o/a; Rauland part/dwg #VG–2044.	Holds POWER plug in case.	
			RECEIVER GROUP		
	*	*	BOARD, terminal: 7 brass lug term 2 inserts; phenolic; 2" lg x 1 5/16" wd x 1/16" thk, less term and inserts; stamped "C–53, R–21, and C–52"; Rauland part/dwg #VT–0220.	Mounting for capacitors C53 and C52 and resistor R21.	2Z9407–92
	*	*	BOARD, terminal: 9 brass lug term; 2 spacers; phenolic; 3" lg x 1⅛" wd x 1/16" thk, less term and spacers; stamped "R–1, R–2, R–8, L–16, and C–33"; Rauland part/dwg #VT–0216.	Mounting for resistors R1, R2, and R8, inductor L16, and capacitor C33.	2Z9402.361
	*	*	BOARD, terminal: 18 brass lug term; phenolic; incl 2 mtg bkt; stamped "C–35, C–54, R–16, C–48, C–47, R–18, R–17, C–49, C–46"; 2 9/16" lg x 1⅜" wd x 1/16" thk, less term and bkt; Rauland part/dwg #VT–0218.	Parts mounting board-----	2Z9418.65
C36	*	*	CAPACITOR, fixed: ceramic; 2 uuf ±.5 uuf; neg temp coef 750 uuf/uf/°C; 500 vdcw; max body dimen .250" diam x .562" lg; JAN type CC21UK020D.	Crystal oscillator, output coupling.	3D9002–31

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
C51	*	*	CAPACITOR, fixed: ceramic; 7 uuf ±.5 uuf; zero temp coef; 500 vdcw; max body dimen .460" lg x .240" diam; JAN type CC30CK070D.	V7, bfo output coupling.	3D9007–18
C39	*	*	CAPACITOR, fixed: ceramic; 51 uuf ±5%; neg temp coef 330 uuf/uf/°C; 500 vdcw; max body dimen .460" lg x .240" diam; JAN type CC30SA510J.	Crystal oscillator, grid leak.	3D9051–23
C52, C47	*	*	CAPACITOR, fixed: ceramic; 100 uuf ±10%; neg temp coef —750 uuf/uf/°C; w/tol ltr J; 500 vdcw; .460" lg x .240" diam; 2 radial wire leads; uninsulated; JAN type CC30UJ101K.	C52: V5, plate load bypass C47: V5, detector i-f bypass.	3D9100–246
C29	*	*	CAPACITOR, fixed: ceramic; 91 uuf ±5%; neg temp coef 750 uuf/uf/°C; 500 vdcw; max body dimen .460" lg x .240" diam; JAN type CC30UJ910J.	V2, oscillator grid leak	3D9091–8
C57	*	*	CAPACITOR, fixed: ceramic; 1,500 uuf ±20%; variable temp coef; 300 vdcw; max body dimen .625" lg x $\frac{1}{4}$" diam; Muter type #BB–B–1200.	V6, plate i-f bypass	3DA1.500–18
C9, C55	*	*	CAPACITOR, fixed: paper; 130,000 uuf ±20%; 150 vdcw; body dimen $1\frac{15}{16}$" lg x $\frac{9}{16}$" diam less bkt; oil filled; Chi Cond #500; Rauland part/dwg #CO–134.	C9: V1, screen bypass C55: V6, screen bypass	3DA130–5
C40	*	*	CAPACITOR, fixed: paper; 250,000 uuf ±19%; 250 vdcw; HS metal can; $1\frac{1}{16}$" lg x $\frac{3}{4}$" diam; synthetic oil impr and filled; one ins lead #18 AWG 3" lg 1 end; int gnd; mtd by bkt soldered to can at lead end w/mtg hole in ctr; Gudeman Mfg type #7016.	V3, plate circuit bypass	3DA250–88
C34A, C34B	*	*	CAPACITOR, fixed: electrolytic; 2 sect; 10–800 uf +150% —10%; 150–6 vdcw; $2\frac{1}{16}$" lg x 1" diam less lugs; Magnavox #4273.	C34A: Filament circuit filter capacitor. C34B: B+ filter capacitor	3DB800–2
C61	*	*	CAPACITOR, fixed: mica; 240 uuf ±5%; 500 vdcw; temp coef ltr C; $\frac{51}{64}$" lg x $\frac{15}{32}$" wd x $\frac{7}{32}$" thk; molded low loss phenolic case; 2 axial wire leads; spec JAN–C–5; JAN type CM20C241J.	Output impedance-coupling transformer hash bypass.	3K2024132
C49	*	*	CAPACITOR, fixed: ceramic; 250 uuf ±20%; variable temp coef; 500 vdcw; max body dimen .625" lg x .125" diam; Muter type BB–KB1200.	V5, diode load	3D9250–65

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9--*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
C41	*	*	CAPACITOR, fixed: mica; 300 uuf ±5%; 500 vdcw; max body dimen 53/64" lg x 15/32" wd x 7/32" thk; JAN type CM20B301J.	Crystal oscillator, feedback capacitor.	3K2030122
C8, C28, C53	*	*	CAPACITOR, fixed: ceramic; 1,000 uuf ±20%; variable temp coef; 300 vdcw; body dimen .625" lg x .121" diam; Muter type #BB–K-1200.	C8: V1, grid coupling C28: V2, grid coupling C53: V6, grid coupling	3DA1–148.1
C10, C24, C30, C33, C35, C43, C46, C48, C50, C54, C56, C60	*	*	CAPACITOR, fixed: paper; 10,000 uuf ±20%; 120 vdcw; body dimen 51/64" lg x 15/32" wd x 7/32" thk; JAN type CN20E103M.	C10: V1, plate circuit r-f bypass. C24: Filament circuit r-f bypass. C30: V2, screen r-f bypass C33: V3, grid return r-f bypass. C35: V3, screen i-f bypass C43: V4, plate circuit r-f bypass. C46: V4, screen r-f bypass C48: V5, audio grid coupling. C50: V5, screen r-f bypass C54: V6, bias cell audio bypass. C56: V6, sidetone coupling and d-c blocking. C60: T8, center tap r-f ground.	3DA10–380
C4, C5, C6, C15, C16, C17, C25, C26, C27	*	*	CAPACITOR, variable: air; 2–11.5 uuf; 1/64" air gap; .906" lg x .640" wd x 17/32" d less shaft; Rauland part/dwg #CV–110A.	C4: T1, band 3 trimmer C5: T1, band 2 trimmer C6: T1, band 1 trimmer C15: T2, band 3 trimmer C16: T2, band 2 trimmer C17: T2, band 1 trimmer C25: T3, band 3 trimmer C26: T3, band 2 trimmer C27: T3, band 1 trimmer	3D9011VE5
C7A, C7B, C7C	*	*	CAPACITOR, variable: air; 3 sect; 15–180 uuf per sect; .027" air gap; body dimen 7/16" h x 19/16" wd x 341/64" lg less shaft; Oak part/dwg #1152–3–20A.	Receiver main tuning capacitors.	3D9180V–3
BT1	*	*	BATTERY, dry: 5 v; 3/4" diam x 15/8" h less mtg bkt; 4 zinc and vanadium pentoxide acorn shaped cells in HS aluminum can; Rauland #JB–0005.	V6, signal grid bias cell	3A9047–1
T8	*	*	COIL, RF: BFO transformer; single pie wnd tapped; rectangular aluminum shield can; body dimen 21/64" h x 7/8"; incl C58, C59, R26; Rauland part/dwg #LU–0002.	Bfo coil assembly	2C5395–1306/T4

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 2	Col. 1			
L16	*	*	COIL, RF: choke; single wnd single layer wnd w/iron core; unshielded; 30 uh, 42 turns #28 E wire; 1 7/32" lg x 5/16" diam o/a; Rauland part/dwg #LC–0164.	V2, filament choke	3C323–177A
T7	*	*	COIL, RF: osc calibrator; single tapped pie wnd w/iron core; rectangular aluminum shield can; 13/16" h x ⅞"; incl C42, R14; Rauland part/dwg #LL–0017.	Crystal calibrator oscillator coil assembly.	2C5395–1306/C12
T1	*	*	COIL ASSEMBLY, RF: antenna; aluminum shield can, 3 double wnd coils, stamped "T1"; incl C1, C2, C3; body dimen 2.687" h x 1⅜"; Rauland part/dwg #VG–2079.	Receiver antenna transformer assembly.	3C1084Z28–4
T2	*	*	COIL ASSEMBLY, RF: mixer; aluminum shield can; 3 double wnd coils w/adj iron cores; 2.687" h x 1⅜" x 1⅜"; stamped "T2"; Rauland part/dwg #VG–2080.	R-f coupling transformer assembly between V1 and V2.	3C1084Z28–5
T3	*	*	COIL ASSEMBLY, RF: osc; aluminum shield can; 3 tapped coils w/adj iron core; body dimen 2.687" h x 1⅜" x 1⅜"; stamped "T3"; incl C–18 through C–23, R–3, R–4, R–5; Rauland part/dwg #VG–2081.	V2, h-f oscillator coil assembly.	3C1084Z28–3
J3	*	*	CONNECTOR, female contact: 9 round pol cont; straight; 3 1/16" lg x 1⅜" wd x ¼" thk less cont; stamped "R–24, R–28, R–29, C–56, 1–9"; Rauland part/dwg #VG–2094.	Receiver power input receptacle.	2Z3070–39
	*	*	COVER: jack; steel w/rubber insert; 1⅛" lg x 25/32" wd x 13/32" d; Rauland part/dwg #VG–2012.	PHONES jack cover	2Z3352.156
I1	*	*	CRYSTAL UNIT CR–2/U: quartz; 200 kc; bakelite holder; 7/16" wd x 1⅛" lg x 1 1/16" h less term; for receiver; Sig C spec 71–3021.	Crystal for crystal calibrator oscillator.	2X105–200
	*	*	DIAL: calibrated tuning; aluminum hub; vinylite dial; calibrated in 3 bands, inside band 2–3.6 mc, ctr band 3.6–6.6 mc, outside band 6.6–12 mc; 3 concentric scales w/black lines and numerals on white background; 3 1/16" diam x 13/64" thk o/a; Rauland part/dwg #VG–2077.	Receiver tuning dial	2Z3718.86
	*	*	DRIVE, capacitor: gear type; for tuning gang; approx 3½" lg x 3⅜" wd x ⅞" d less shaft; incl miniature bayonet socket; Rauland part/dwg #VG–2164.	Receiver tuning drive assembly.	2Z3876.92

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	GASKET: receiver panel to case seal; rubber; 10 17/32" lg x 5" wd, wall 17/64" thk o/a; Rauland part/dwg #QR-0180.	Power input socket gasket	2Z4868.442
	*	*	GASKET: molded "0" ring type; rubber; .175" ID, 5/16" OD x .07" diam wall; Victor Gasket #AN-6227-3.	Seals main tuning capacitor shaft.	2C5395–1306/G7
J1, J2	*	*	JACK, telephone: for 2 cond ¼" diam plug 1 1/16" lg x 1" o/a less cable; jack enclosed in rubber balloon; Rauland part/dwg #VG-2085.	Receiver PHONES jack	2Z5595–4
	*	*	KNOB: bar; aluminum; for ¼" diam shaft w/parallel milled flats 3/16" wd x 5/16" lg; single #6–32 x 5/16" lg set screw; double green fluorescent marker on top and sides 1 3/16" diam x ⅞" h o/a; Rauland part/dwg #QD–0129.	PHONE-C. W.-NET-CAL. switch knob.	2Z5821–109
	*	*	KNOB: bar; aluminum; for ¼" diam shaft w/parallel milled flats 3/16" wd x 5/16" lg; single #6–32 x 5/16" lg set screw; single green fluorescent marker on 1 end; 1 3/16" diam x ⅞" h o/a; Rauland part/dwg #QD–0135.	Band switch, A. F. GAIN and R. F. GAIN knobs.	2Z5786.110
	*	*	KNOB: round w/dial lock; phenolic knob, SS dial lock; for 5/16" diam shaft; single #8–32 set screw; knob 1 1/16" diam x 1 3/32" h w/dial lock and bkt extending ⅞" on ea side; Rauland part/dwg #VG–2249.	Tuning knob	2Z5821–111
E1	*	*	LAMP, incandescent: 60 ma, 2 v; bulb T–3¼ clear; 1 3/16" lg o/a; miniature bayonet base; Mazda #49, Sylvania #S–49.	Pilot light for receiver	2Z5971.1
	*	*	LAMPHOLDER: miniature bayonet; brass; 1 9/32" lg x 1¼" wd x 7/16" thk o/a; incl mtg bkt; Rauland part/dwg #VG-2163.	Pilot light socket for receiver.	2Z5883–316
	*	*	LENS, magnifying: single; plano convex; rectangular 35/64" wd x 15/16" lg; 1 15/16" lg x 1" wd x .227" d o/a; lucite; Rauland part/dwg #AC–0993.	Receiver tuning dial glass	2Z6126–8
	*	*	POST, binding: screw type; 1" lg x ⅝" diam o/a; w/molded clear plastic cap; Eby #13 "Sergeant" modified.	ANT. and GND. terminals	3Z741–21.1
CR1	*	*	RECTIFIER, metallic: selenium; input 1.7 v; output 1.4 v, 350 ma max; round; 1 5/16" diam x 1" d o/a; Fansteel Metallur #Q–10479, Benwood Linze #217S1.	Receiver tube filaments voltage regulator.	3H4858–16

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—Continued

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
R28	*		RESISTOR, fixed: comp; 270 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF271K.	R-f and i-f circuits, plate and screen decoupling resistor.	3RC20BF271K
R29	*	*	RESISTOR, fixed: comp; 1,500 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF152K.	V5 and V6, plate dropping resistor.	3RC20BF152K
R15	*	*	RESISTOR, fixed: comp; 4,700 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF472K.	V4, plate circuit decoupling resistor.	3RC20BF472K
R2, R12, R23, R24	*	*	RESISTOR, fixed: comp, 27,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF273K.	R2: V1, plate-dropping resistor. R12: V3, screen-dropping resistor. R23: V6, screen-dropping resistor. R24: Sidetone isolating resistor.	3RC20BF273K
R8	*	*	RESISTOR, fixed: comp; 33,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF333K.	V2, screen-dropping resistor.	3RC20BF333K
R7, R17	*	*	RESISTOR, fixed· comp; 56,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF563K.	R7: V2, h-f oscillator grid leak resistor. R17: V5, part of detector load.	3RC20BF563K
R11, R27	*	*	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF104K.	R11: V1, screen-dropping resistor. R27: V7, screen-dropping resistor.	3RC20BF104K
R25	*	*	RESISTOR, fixed: comp; 150,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF154K.	V7 grid leak resistor________	3RC20BF154K
R13, R18, R21	*	*	RESISTOR, fixed: comp; 470,000 ohms ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF474K.	R13: Crystal calibrator oscillator grid leak. R18: Part of V5 detector load. R21: V5, plate load resistor.	3RC20BF474K
R1, R6, R16, R22	*	*	RESISTOR, fixed: comp; 1 meg ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF105K.	R1: V1, grid resistor______ R6: V2, grid resistor______ R16: AVC filter resistor____ R22: V7, plate load________	3RC20BF105K
R20	*	*	RESISTOR, fixed: comp; 2.2 meg ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF225K.	V5, screen-dropping resistor.	3RC20BF225K
R10	*	*	RESISTOR, fixed: comp; 4.7 meg ±10%; ½ w; max body dimen .468" lg x .249" diam; JAN type RC20BF475K.	V1 and V3 additional screen dropping resistor in NET position only.	3RC20BF475K

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col 2			
R9	*	*	RESISTOR, variable: carbon; 1 meg ±20%; ¼ w; 3 term; body dimen 15/32" thk x 15/16" diam w/term board 5/16" lg; bushing ⅜"–32 x 5/16" lg, shaft 1 3/16" lg x ¼" diam slotted; taper BD; CTS #45; Rauland part/dwg #1058.	R. F. GAIN control	3Z7499–1.51
R19A, R19B	*	*	RESISTOR, variable: 2 sect; carbon; front sect 1 meg, rear sect 2 meg ±20%; ¼ w; 6 term; body dimen 15/16" diam x 29/32" d, bushing ⅜"–32 x 5/16" lg, shaft 1 3/16" lg x ¼" diam; both sect taper A; CTS #2–45; Rauland part/dwg #105T.	A. F. GAIN control	3Z7499–2.22
	*	*	SCREW, shoulder: flat Fil H; steel; #3–48; 11/32" lg w/.189" lg thd; head 17/64" diam x .109" d; shoulder .163" diam x .046" lg; Rauland part/dwg #BG–1118.	Part of BAND change mechanism.	6L15003–5–1.12S
	*	*	SEAL, water: rubber w/metal insert; 5/16" ID, 1¼" OD x 5/64" thk o/a; Rauland part/dwg #VG–1216.	Seals dial shaft	2Z3775–1
	*	*	SHAFT, band switch; metal; incl detent mechanism; shaft 5 7/32" lg x ¼" diam o/a; detent mechanism 1¼" x 1⅛"; Rauland part/dwg #VG–2082; (for ref symbol S1A through S1F).		2Z8202.68
	*	*	SHIELD ASSEMBLY, tube: aluminum; rectangular w/7 cylindrical can shields; mts by screws; 1½" h x 4⅜" wd x 5⅝" lg o/a; Rauland part/dwg #VG–2071.	Shield plate for seven tubes.	2Z8304.110
	*	*	SHUTTER, dial: freq band change; aluminum shutter, steel arm; 5½" lg x 2¾" wd x ¼" d o/a; Rauland part/dwg #VG–2076.	Exposes operating band	2Z8550.5
X9	*	*	SOCKET, crystal: oblong, 2 cont; phenolic; 13/16" lg x 5/16" wd x 17/32" h o/a less term; Cinch #9816.		2Z8672.8
X2	*	*	SOCKET, tube: 7 prong miniature; ceramic; 1 3/32" lg x 25/32" wd x 13/16" d o/a; Cinch #CP–50207.	V2 socket	2Z8677.116
S2	*	*	SWITCH, push: SPDT, momentary cont in 1 position; body dimen ¾" diam x ½" lg, shaft ⅜" lg x ¼" diam, bushing ⅜"–32 x ¼" lg; Stackpole #W–2044; Rauland part/dwg #X–0181.	DIAL LIGHT	3Z9824–99
S4	*	*	SWITCH, rotary: SPDT; single phenolic wafer; body dimen 27/32" wd x 1 9/32" lg x 5/16" h; shaft 13/32" lg x ¼" diam w/scdr slot,	Output IMPEDANCE switch.	3Z9825–62.92

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	bushing $\frac{3}{8}$"–32 x $\frac{1}{4}$" lg; Oak #23; Rauland part/dwg #X–0097.		
S1A, S1B, S1C, S1D, S1E, S1F			SWITCH, rotary: 2 pole 3 position; 2 ceramic and 4 bakelite wafers; 3.704" lg x $2\frac{9}{16}$" max wd x $1\frac{3}{8}$" max h less shaft; Rauland part/dwg #X–0183.	BAND change switch	3Z9825–41.12
S3–1, S3–2, S3–3	*	*	SWITCH, rotary: 6 pole 4 position; 2 phenolic wafers; body dimen $1\frac{7}{8}$" lg x $1\frac{9}{16}$" wd x $1\frac{11}{32}$" d, shaft $\frac{25}{32}$" lg x $\frac{1}{4}$" diam; bushing $\frac{3}{8}$"–32 x $\frac{1}{4}$"; lg; Oak #29893–H2.	PHONE-CW-NET-CAL. switches.	3Z9825–62.284
T9	*	*	TRANSFORMER, AF: output; pri 20,000 ohms, secd 4000 ohms tapped at 250 ohms impedance; copper shield; $1\frac{3}{16}$"x $1\frac{3}{16}$" x $2\frac{1}{16}$" h; HS; Foster AP #X–1779.	A-f output transformer	2Z9632.437
T4, T5, T6	*	*	TRANSFORMER, IF; 456 kc peak; interstage shielded; $2\frac{1}{64}$" h x $\frac{7}{8}$" x $\frac{7}{8}$"; incl 2 fixed capacitors; Rauland part/dwg #LR–0002.	Receiver i-f transformers	2Z9641.80
V1, V3	*	*	TUBE, electron: JAN–1L4, pentode.	VI: R-f amplifier V3: I-f amplifier	2J1L4
V4, V2, V7	*	*	TUBE, electron: JAN–1R5; pentagrid converter.	V4: I-f amplifier and crystal oscillator. V2: Converter V7: Beat-frequency oscillator.	2J1R5
V5	*	*	TUBE, electron: JAN–1S5; diode-pentode.	Detector and a-f amplifier	2J1S5
V6	*	*	TUBE, electron: JAN–3Q4; power pentode.	Audio amplifier	2J3Q4
			TRANSMITTER GROUP		
	*	*	BOARD, terminal: 3 banana jacks; phenolic; $6\frac{1}{2}$" lg x $\frac{1}{2}$" wd x $\frac{3}{16}$" thk less term; stenciled "J–101A, J–101B, J–101C"; Rauland part/dwg #VT–0208.	Mounting for three banana jack terminals.	2Z9403.210
	*	*	BOARD, terminal: 6 brass term, 3 brass inserts phenolic; $1\frac{11}{16}$" lg x 1" wd x $\frac{1}{16}$" thk less term; stenciled "R–101, R–121, C–104"; Rauland part/dwg #VT–0206.	Mounting strip for two resistors and one capacitor.	2Z9406.253
J106	*	*	BOARD, terminal: 9 solder lugs, 9 female cont connectors; phenolic; $2\frac{3}{4}$" lg x $1\frac{3}{16}$" wd x $\frac{1}{8}$" thk less term; stenciled "1" to "9" incl; Rauland part/dwg #VT–0205.	Receiver power socket	2Z9409.66

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	BOARD, terminal: 11 brass term, 2 brass inserts bakelite; $1\frac{17}{32}$" lg x $1\frac{3}{32}$" wd x .062" thk less term; stenciled "R–103, R–106, R–107, R–111, R–112"; Rauland part/dwg #VT–0204.	Mounting strip for five resistors.	2Z9411.44
	*	*	BOARD, terminal: 13 brass term lugs, 5 brass inserts; phenolic; $2\frac{1}{4}$" lg x $1\frac{1}{2}$" wd x .062" thk less term; stenciled "C–136, C–137, C–140, R–113, R–114, R–116"; Rauland part/dwg #VT–0201.	Mounting strip for three capacitors and three resistors.	2Z9413.29
	*	*	BUSHING: brass; male and female; $\frac{19}{32}$" lg x $\frac{7}{8}$" OD, .690" ID; male thd $\frac{13}{16}$"–27 x $\frac{13}{32}$" lg, female thd $\frac{3}{4}$"–16 x $\frac{3}{16}$" lg; Rauland part/dwg #BG–0325.	For mounting indicator lampholder.	2Z1409–98
	*	*	CAP: aluminum; 1" diam x $\frac{9}{16}$" thk less chain; female thd $\frac{7}{8}$"–20; Amphenol #9760–14 plus "S" hook.	Cover for battery connection.	2Z1607–58
C147	*	*	CAPACITOR, fixed: ceramic: 5 uuf ±.25 uuf; neg temp coef 750 uuf/uf/°C; 500 vdcw; max body dimen .562" lg x .250" diam; Erie #N75K.	V102, part of doubler plate tank.	3D9005–71
C124, C125	*	*	CAPACITOR, fixed: ceramic; 6 uuf ±10%; neg temp coef 100 uuf/uf/°C; 1000 vdcw; max body dimen ½" lg x ¼" diam; Muter #AB–100.	R-f coupling capacitor for neon indicator I101.	3D9006–16
C126, C127	*	*	CAPACITOR, fixed: ceramic; 10 uuf ±10%; neg temp coef 150 uuf/uf/°C; 1000 vdcw; max body dimen ½" lg x ¼" diam; Muter #AB–N150.	Transmitter antenna tuning circuit coupling capacitor.	3D9010–108
C123	*	*	CAPACITOR, fixed: ceramic; 45 uuf ±5%; neg temp coef 750 uuf/uf/°C; 1000 vdcw; body dimen $1\frac{1}{16}$" lg x $\frac{3}{16}$" diam; Muter #CB–N750.	Transmitter antenna tuning circuit fixed tuning capacitor.	3D9045–8
C122	*	*	CAPACITOR, fixed: ceramic; 80 uuf ±5%; neg temp coef 750 uuf/uf/°C; 1500 vdcw; body dimen $1\frac{1}{16}$" lg x ¼" diam; Muter #DB–N750.	BAND 1 power amplifier coil output coupling capacitor.	3D9080–12
C135	*	*	CAPACITOR, fixed: electrolytic; 100 uf ±200% –10%; 6 vdcw; body dimen $1\frac{1}{16}$" lg x ⅝" diam; Dubilier #BRH601.	Microphone input filter capacitor.	3DB100–10
C136	*	*	CAPACITOR, fixed: ceramic; 470 uuf ±20%; variable temp coef; 300 vdcw; body dimen .375" lg x .121" diam; Muter #AB–K–1200.	Feedback capacitor for V105 and T113.	3D9470–16

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—Continued

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
C105, C109, C110	*	*	CAPACITOR, fixed: mica; 510 uuf ±5%; 500 vdcw; max body dimen 51/64" lg x 15/32" wd x 7/32" thk; JAN type CM20B511J.	C105: V101, grid leak C109: V102, signal grid coupling capacitor. C110: V103, signal grid coupling capacitor.	3K2051122
C117	*	*	CAPACITOR, fixed: ceramic; 1,000 uuf ±20%; variable temp coef; 300 vdcw; body dimen .625" lg x .121" diam; Muter #BB–K–1200, Erie type #HI–K.	V103, suppressor grid bypass.	3DA1–148.1
C142	*	*	CAPACITOR, fixed: mica; 1,000 uuf ±10%; 500 vdcw; max body dimen 53/64" lg x 53/64" wd x 9/32" thk; JAN type CM30B102K.	V102, screen bypass	3K3010221
C115	*	*	CAPACITOR, fixed: ceramic; 6,800 uuf +30% –20%; variable temp coef; 300 vdcw; body dimen 1 1/16" lg x 17/64" diam; Muter #DB–K–1200.	V103, filament bypass	3DA6.800–2
C104	*	*	CAPACITOR, fixed: mica; 8,200 uuf ±10%; 300 vdcw; max body dimen 53/64" x 53/64" x 11/32"; JAN type CM35E822K.	V101, plate and screen circuits decoupling capacitor.	3K3582251
C103, C140	*	*	CAPACITOR, fixed: paper; 10,000 uuf ±20%; 120 vdcw; max body dimen 51/64" lg x 15/32" wd x 7/32" thk; JAN type CN20E103M.	C103: V101, screen bypass and crystal coupling. C140: V105, fixed tuning capacitor for mcw operation.	3DA10–380
C116, C121, C148		*	CAPACITOR, fixed: paper; 10,000 uuf ±20%; 1000 vdcw; max body dimen 1 15/32" lg x 49/64" wd x 13/32" thk; JAN type CN43A103M.	C116: V103, screen bypass. C121: V103, plate circuit decoupling. C148: BAND 3 power amplifier coil output coupling.	3DA10–382
C111, C112, C113	*	*	CAPACITOR, variable: air; 1.8–13.8 uuf; .015" air gap; body dimen 1 1/8" lg x 7/8" wd x 43/64" d; Rauland part/dwg #CV–140–A.	Trimmer capacitors for doubler coils T104A, B, and C, respectively.	3D9013VE8–1
C102	*	*	CAPACITOR, variable: air; 2.5–8.5 uuf ±15%; .030" air gap; body 1 1/4" lg x 15/16" wd x 25/32" d, shaft 7/16" lg x 1/4" diam; bushing 3/8"–32 x 9/32" lg; Oak #1151–AT; Rauland part/dwg #CV–090A.	V101, mo trimmer capacitor.	3D9008VE5–2
C101A, C101B, C101C	*	*	CAPACITOR, variable: air; 3 sect; 11.2–135.4 uuf, 118.8–163.1 uuf, 15.1–202.6 uuf, .041", .023", and .035" air gap, respectively; 6 11/16" lg x 3 1/4" wd x 3 1/4" h less shaft, shaft 3 1/2" lg x .313" diam w/plug mtg board; Rauland part/dwg #CV–521.	Transmitter main tuning capacitor.	3D9202VE6
C128A, C128B, C128C	*	*	CAPACITOR, fixed: ceramic; 3 sect; 135–60–120 uuf ±6%; variable neg temp coef 300–800 uuf/	Transmitter antenna circuit shunt capacitors.	3DE135

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	uuf/°C; 1000 vdcw; body dimen 2⅜" lg x 1⅜" diam; glass envelope vacuum sealed in aluminum can; 7 pin, term on top; Rauland part/dwg #VG–2020.		
	*	*	CHART, calibration: phenolic; 1 15/16" lg x 1 21/32" wd x 1/16" thk; black print on white background; Rauland part/dwg #NC–0549.	Transmitter dial calibration chart.	6D10105–16
K102	*	*	CIRCUIT BREAKER: magnetic; SP normally open; 700 v, 30 ma resistive load cont rating; HS metal case; 3 5/32" lg x 1½" o/a; Rauland part/dwg #D–0055.	V103, signal grid circuit overload relay.	3H937
	*	*	CLAMP, tube: metal; single #6 screw mtg; 1 5/32" diam x ¾" h; w/⅜" strap for clamping tube; Birtcher #926A; Rauland part/dwg #AG–1866.	----------------------------	2Z2636–28
	*	*	CLIP, tube contact: brass; 1⅜" lg x 9/16" h x ⅞" max wd; uninsulated; for 9/16" diam tube cap; Natl Co #12; Rauland part/dwg #JC–0011.	V103, plate cap-------------	2Z2712
L103	*	*	COIL, AF: filter choke; single wnd; 5.5 hy; 1.2 ma, 1200 ohms DC resistance; 1½" lg x 1" diam o/a; Stancor #234C–1; Rauland part/dwg #LC0163.	V105, plate circuit a-f filter choke.	3C323–177B
L102	*	*	COIL, RF: antenna loading; single wnd, single layer wnd; unshielded; 1 13/32" wd x 1 35/64" h x 1¼" lg; Rauland part/dwg #LX–0023.	Antenna circuit loading coil.	3C1084Z28–7
L101	*	*	COIL, RF: choke; single pie, universal wnd; iron core; unshielded; 1.25 mh; 25 ma, 10 ohms DC resistance 1½" lg x 15/16" diam; Rauland part/dwg #LC–0162.	V102, r-f plate choke------	3C323–177D
L104	*	*	COIL, RF: single wnd, single layer wnd; unshielded; 19 uh, 72 turns #34 AWG copper E wire; ⅞" lg x 9/32" diam body; Rauland part/dwg #LC–0161.	Antenna resonance INDICATOR circuit compensating coil.	3C1084Z28–8
T104A	*	*	COIL, RF: doubler plate; single wnd, single layer wnd; unshielded; 18⅔ turns #20 E copper wire, tapped at 8⅓ turns; 2 1/16" lg x ⅝" diam; Rauland part/dwg #LX–0017.	V102, BAND 1 plate coil---	3C1084Z28–12
T104B	*	*	COIL, RF: doubler plate; single wnd, single layer wnd; unshielded; 29⅓ turns #24 E copper wire tapped at 17⅔ turns; 2 1/16" lg x ¾" diam body; Rauland part/dwg #LX–0018.	V102, BAND 2 plate coil---	3C1084Z28–16

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
T104C	*	*	COIL, RF: double plate; single wnd, single layer wnd; unshielded; 57⅓ turns #27 E copper wire tapped at 32⅔ turns; 2 1/16" lg x ¾" diam; Rauland part/dwg #LX–0019.	V102, BAND 3 plate coil___	3C1084Z28–11
T101	*	*	COIL, RF: oscillator; 2 wnd, single layer wnd; aluminum shield can; 7½ turns #24 E wire, 24⅝ turns #24 E wire tapped at 15⅔ turns; 3 5/32" h x 1 9/16" x 1 9/16"; stenciled "BAND 1 OSC"; Rauland part/dwg #VG–1976.	V101, BAND 1 oscillator coil.	3C1084Z28–17
T102	*	*	COIL, RF: oscillator; 2 wnd, multiple layer wnd; aluminum shield can; 53⅝ turns tapped at 27⅔ turns #26 E wire, 14⅕ turns #30 E wire; 3 11/16" lg x 1½" x 1½" less term; stenciled "OSC, T–102, C–107, BAND 2"; Rauland part/dwg #VG–1977.	V101, BAND 2 oscillator coil.	3C1084Z28–15
T103	*	*	COIL, RF: oscillator; 2 wnd, multiple layer wnd; aluminum shield can; 90 turns #30 E wire tapped at 32⅔ turns, 28 turns #30 E wire; 3 11/16" lg x 1½" x 1½", Rauland part/dwg #VG–1978.	V101, BAND 3 oscillator coil.	3C1084Z28–18
T107	*	*	COIL, RF: power amplifier plate; single wnd, single layer wnd; unshielded; 3" lg x 1 1/16" max diam; stenciled "LX–0020 BAND 1"; Rauland part/dwg #LX–0020.	V103, BAND 1 power amplifier plate coil.	3C1084Z28–19
T108	*	*	COIL, RF: power amplifier plate; 2 wnd, single layer wnd; unshielded; 3⅜" lg x 1 11/16" max diam; stenciled "LX–0021 BAND 2"; Rauland part/dwg #LX–0021.	V103, BAND 2 power amplifier plate coil.	3C1084Z28–13
T109	*	*	COIL, RF: power amplifier plate; 2 wnd, unshielded; 3¾" lg x 1 9/32" max diam; stenciled "LX–0022 BAND 3"; Rauland part/dwg #LX–0022.	V103, BAND 3 power amplifier plate coil.	3C1084Z28–14
T114	*	*	COIL, RF: receiver antenna transformer; 2 wnd, aluminum shield can; 50 turns #33 E wire, 20 turns #26 E wire; 1½" lg x 1⅛" less term; incl, C141; Rauland part/dwg #LX–0025.	Receiver antenna input transformer.	3C1084Z28–10
T110A, T110B	*	*	COIL ASSEMBLY, RF: antenna tuning; steatite coil forms, mycalex ends; unshielded; less iron cores; 4 wnd, 2 are tapped; 2.119" h x 1¼" wd x 2⅛" lg; Rauland part/dwg #LX–0024.	Transmitter antenna tuning coils.	3C1084Z28–6
T104	*	*	COIL ASSEMBLY, RF: freq doubler; iron cores, phenolic forms,	V102, plate coil__________	3C1084Z28–9

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	rectangular aluminum shield can; 3¼" lg x 1½" wd x 2⅛" h less term; stenciled "BAND 3, BAND 1, BAND 2, DOUBLER"; Rauland part/dwg #VG–1979.		
J103	*	*	CONNECTOR, male contact: Sig C Socket SO–134; 4 round pol cont; straight; 29/32" lg w/1 3/16" sq fl; Amphenol #97–3102–14S–2P.	BATTERY input receptacle.	2Z8799–134
	*	*	CORE, adjustable tuning: iron core w/brass gear rack; 4 9/32" lg x .572" diam o/a; Rauland part/dwg #VG–1992; (for antenna loading coil).	Part of r-f coil assembly T110A and T110B.	2Z3262–19
	*	*	COVER: jack; rubber cap, metal cover; 1⅛" lg x 25/32" wd x d o/a; Rauland part/dwg #VG–2012.	MIKE and KEY jacks cover.	2Z3352.156
	*	*	GASKET: antenna binding post; rubber; 1 11/32" lg x ¾" wd x 1/32" thk o/a; Rauland part/dwg #QR–0027.	Waterproof antenna binding post hole.	2Z4868.448
	*	*	GASKET: battery connector plug; rubber; ⅞" ID 1 3/16" sq x .032" thk; Rauland part/dwg #QR–0046.	Makes plug J103 watertight.	2C5395–1306/G4
	*	*	GASKET: binding post; rubber; .114 ID, .254" OD x .070" thk; Victor Gasket #AN–6227–1.	Waterproof binding post hole.	2Z4868.445
	*	*	GASKET: capacitor shaft; rubber; .175" ID, 5/16" OD x .070" diam wall; Victor Gasket #AN–6227–3.	Waterproof capacitor shaft feed through hole.	2C5395–1306/G7
	*	*	GASKET: indicator lampholder; rubber; 13/16" ID, 1 1/16" OD x .032" thk; Rauland part/dwg #QR–0042.	------------------------	2C5395–1306/G10
	*	*	GASKET: light filter holder; rubber; .718" ID, .875" OD x .048" thk; Rauland part/dwg #QR–0041.	------------------------	2C5395–1306/G8
	*	*	GASKET: power plug; rubber: 1 29/64" ID, 1 29/32" sq x 3/32" thk; Rauland part/dwg #QR–0178.	------------------------	2Z4868.446
			GASKET: transmitter 10 9/32" to case seal; rubber; 10 17/32" lg x 10" wd x 17/64" thk o/a; Rauland part dwg #QR–1077.	------------------------	2Z4868.447
	*		INSULATOR, bushing: extruded washer type; phenolic; .1405" ID x ⅜" OD x ⅛" thk; shoulder 11/64" OD x 1/16" h; Rauland part/dwg #A –0765; (for resistor mtg).	------------------------	3G1838–6.25
		*	INSULATOR, bushing: phenolic, wax impr; approx ⅛" h, body .1405 ID x 5/16" OD w/1/16" thk x .112" diam shoulder; Rauland part/dwg #QP–0065.	------------------------	3G1795–15

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
R113	*	*	RESISTOR, fixed: comp; 15,000 ohms ±10%; ½ w; max body dimen .468″ lg x .249″ diam; JAN type RC20BF153K.	V105, screen dropping resistor.	3RC20BF153K
R101	*	*	RESISTOR, fixed: comp; 18,000 ohms ±10%; ½ w; max body dimen .468″ lg x .249″ diam; JAN type RC20BF183K.	V101, screen dropping resistor.	3RC20BF183K
R114 R116	*	*	RESISTOR, fixed: comp; 39,000 ohms ±10%; ½ w; max body dimen .468″ lg x .249″ diam; JAN type RC20BF393K.	T113 modulation transformer load resistors.	3RC20BF393K
R120	*	*	RESISTOR, fixed: comp; 39,000 ohms ±10%; 1 w; max body dimen .750″ lg x .280″ diam; JAN type RC30BF393K.	Section of voltage divider system supplying screen voltage to V102.	3RC30BF393K
R102, R104	*	*	RESISTOR, fixed: comp; 100,000 ohms ±10%; ½ w; max body dimen .468″ lg x .249″ diam; JAN type RC20BF104K.	R102: V101 grid leak resistor. R104: V102 grid leak resistor.	3RC20BF104K
R112	*	*	RESISTOR, fixed: comp; 470,000 ohms ±10%; ½ w; max body dimen .468″ lg x .249″ diam; JAN type RC20BF474K.	V105, grid resistor --------	
R105, R117, R118	*	*	RESISTOR, fixed: ww; 20,000 ohms ±5%; 10w; 3/16″ ID, 1¾″ lg x 5/16″ OD; Clarostat #A–10–F; Rauland part/dwg #RW–2203 B–1.	R105: Part of voltage divider for plate of V102. R117 and R118: V103 screen-dropping resistor.	3Z6620–71
R115	*	*	RESISTOR, variable: carbon; 1 meg ±20%; ⅓w ; 3 solder lug term; body 15/16″ diam x ½″ d; shaft 7/16″ lg x ¼″ diam w/scdr slot; semilog taper; Stackpole #LM modified per Rauland part/dwg #RP–105–R.	SIDETONE VOL. control G.	3Z7499–1.52
	*	*	SEAL, water: rubber bushing w/ brass insert; female; .318″ ID, 7/16″ lg x 1¼″ OD; Rauland part/dwg #VG–1217.	Dial shaft seal------------	2C5395–1306/D1
	*	*	SHELL, connector: power connector plug; aluminum; 1.905″ x 1.905″ x 11/16″ d; 1¾″ = 6 male thd; Rauland part/dwg #VG–2034.	------------------------------	2Z8276–41
	*	*	SHIELD, tube: aluminum; rectangular; spring catch mtg; 3″ lg x 2⅛″ wd x 2⅛″ h o/a; Rauland part/dwg #VG–1957.	Shield plate for three tubes	2Z8304.111
X102 through X107	*	*	SOCKET, crystal: oblong; 2 cont; phenolic; 13/16″ lg x ½″ d x 5/16″ wd; Cinch #9816–1; Rauland part/dwg #SF–0100.	Holds transmitter crystal unit.	2Z8672.8
X109	*	*	SOCKET, tube: 5 prong; bakelite; 1¼″ diam x 7/16″ thk o/a less cont; Amphenol #5ST–5; Rauland part/dwg #ST–500D.	V103 socket -------------	2Z8675.85

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
S104	*	*	SWITCH, push: SPST normally open; brass body; body ⅞" lg x 11/16" diam o/a; bushing ⅜"–32 x ¼" lg; Stackpole type #SM; Rauland part/dwg #X–0103.	DIAL LIGHT control J	3Z9824–42.1
T112	-------	*	TRANSFORMER, AF: input type; pri 250 ohms impedance, secd 50,000 ohms impedance ±20%; cylindrical zinc can, 1½" lg x 1" diam less term, 1 db oper level; pri 30 ohms, secd 1100 ohms DC resistance; freq response 250–2500 cps; 4 soldering lugs protruding from bottom; two #2–56 tapped holes on .656" ctr; Rauland part/dwg #LO–0024–A.	Microphone transformer	2Z9631.137
T113	-----	*	TRANSFORMER, AF: modulation type; pri 18,000 ohms impedance, secd 8000 ohms impedance ±20%, cylindrical zinc can; 1½" lg x 1" diam, less term; 21 dp oper level; pri 425 ohms, secd 725 ohms DC resistance; freq response 250–2500 cps; 4 soldering lugs protruding from bottom; two #2–56 tapped holes on .656" ctr; Rauland part/dwg #LO–0070A.	Modulation transformer	2Z9634.39
V104	*	*	TUBE, electron: JAN–OC3/VR–105.	Voltage regulator	2J0C3/VR105
V103	*	*	TUBE, electron: JAN–2E22	Power amplifier	2J2E22
V101, V102, V105	*	*	TUBE, electron: JAN–3A4	V101: Master oscillator V102: Frequency doubler V105: Modulator	2J3A4
201	-----	*	GASKET: channel type, cover to case seal; black neoprene 52⅜" circum, ⅝" wd x 1/16" thk w/¼" diam bead at 1 side; Rauland part/dwg #QR–0181.		
X1	*	*	SOCKET, tube: 7 cont miniature; 1 piece saddle mtg w/shell for bayonet mtg tube shield; two ⅛" diam mtg holes on ⅞" mtg/c; ceramic w/oval type saddle approx 1⅛" lg x .900" wd x 13/16" h incl term; copper base alloy, silver pl cont; marked TSE7T102; w/ctr shield .156" ID and shock shield; spec JAN–S–28A; JAN type TSE7T102.	V1 socket	2Z8677.99
X3 through X7	*	*	SOCKET, tube: 7 cont, miniature; 1 piece saddle mtg; 2 mtg holes ⅛" diam on ⅞" mtg/c; round ceramic body, 1⅛" lg x .800" wd x 25/32" h excl term; phosphor-bronze silver pl cont; w/shock shield and ctr shield .156" ID;	X3: V3 socket X4: V4 socket X5: V5 socket X6: V6 socket X7: V7 socket	2Z8677.94

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—Continued

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			spec JAN–S–28A; JAN type TSE7101.		
			TRANSMITTER GROUP		
		*	BOARD, terminal: 4 tinned brass solder lug term; lam phenolic board; 1⅜" lg x $1\frac{15}{16}$" wd x $\frac{1}{16}$" thk 2 holes ⅛" diam on $\frac{29}{32}$" ctr; stenciled for identifying parts; Lewyt part/dwg #VT–0203.	Mounting strip for two capacitors.	3Z770–4.58
			BOARD, terminal: 3 brass solder lug term; lam phenolic board; 1¾" lg x 1½" wd x $\frac{1}{16}$" thk less term; 2 holes ⅛" diam on 1" ctr; stenciled for identifying parts; Lewyt part/dwg #VT–0202–L.	Mounting strip for three capacitors and one resistor.	3Z770–3.22
C129	*	*	CAPACITOR, fixed: ceramic; 5 uuf ±.3 uuf; neg temp coef 550 uuf/uf/°C; 500 vdcw; ½" lg x ¼" diam; 2 radial wire leads; ceramic ins; Muter part #AB–N–550.	Part of V101 plate to crystal coupling capacitor.	3D9005–71
C146	*	*	CAPACITOR, fixed: ceramic; 6.5 uuf ±.3 uuf; neg temp coef 750 (±55) uuf/°C; 500 vdcw; .475" lg x ¼" diam; 2 radial wire leads; uninsulated; phenolic seal; Muter type #AB–N750 special.	V101 negative temperature coefficient capacitor for plate tank circuit.	3D9006E5–3
C143	*	*	CAPACITOR, fixed: ceramic; 47 uuf ±10%; temp coef 750 w/tol ltr J; 500 vdcw; .460" lg x .240" diam; 2 radial wire leads; uninsulated; spec JAN–C–20A JAN type CC30VJ470K.	V105 feedback capacitor____	3D9047–39
C144, C145	*	*	CAPACITOR, fixed: mica; 3000 uuf ±10%; 750 vdcw; ¾" lg x ¾" wd x $\frac{5}{16}$" d; molded low-loss phenolic case; 2 axial wire leads; RSW; Micamold type #WXM.	C144: Arc suppressor for keying relay K101. C145: Arc suppressor for overload relay K102.	3DA3–109
C114, C132, C133, C137	*	*	CAPACITOR, fixed: paper; 100,000 uuf ±10%; 120 vdcw; molded phenolic case; $1\frac{15}{32}$" lg x ⅝" wd x ¼" thk; wax filled and impr; 2 axial wire leads; Micamold #40–22.	C114: V103 grid circuit decoupling capacitor. C132: Transmitter filament circuit bypass. C133: Keying relay K101 and microphone voltage supply circuit bypass. V137: V105 screen bypass	3DA100–209.1
C134, C138, C139	*	*	CAPACITOR, fixed: paper; 250,000 uuf ±10%; 250 vdcw; HS metal can; $1\frac{1}{16}$" lg x ¾" diam; synthetic oil impr and filled; 1 ins lead #18AWG 3" lg 1 end; int gnd; mtd by bkt soldered to can at lead end w/mtg hole in ctr; Gudeman Mfg type #7016.	C134: Bypass for 105-volt supply. C138: V105 plate circuit decoupling. C139: Modulation transformer T113 secondary d-c blocking capacitor.	3DA250–88

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
C118, C119, C120	*	*	CAPACITOR, variable: air plate meshing type, single sect; 3.5–9 uuf; SLC characteristic; 600 v RMS; 15/16″ lg x 15/16″ wd x 17/32″ h; shaft 7/16″ lg; locking type; scdr adj; 180 deg rotation; ceramic ins; lug term; 2 mtg holes tapped #4–40 on 21/32″ ctr; spec JAN–C–92; JAN type CT1C010.	V103 plate circuit trimmers.	3D9009V–18
		*	CLIP: electron tube; for holding tube base; spring steel nickel pl; 2″ lg x 1 9/16″ wd x 3/8″ d; 4 spring action fingers on diam; 1 3/8″ diam max opening; Lewyt part/dwg #AG–1100–L.	----------------------------	2Z2712.114
J102	---	*	CONNECTOR, plug: 9 banana male cont, pol; straight; 1.9″ sq x 17/32″ d less cont; 1,500 v DC ins test; round plastic body mtd in sq metal plate; Melmac #592 insert; four .177″ diam holes on 1 5/8″ sq mtg/c; Rauland part/dwg #SM–0149.	Transmitter POWER receptacle.	2Z3029–23
J106	*	*	CONNECTOR, receptacle: 9 round female cont, pol; straight type; silver pl, phosphor bronze banana plugs 3/16″ ID, 9/32″ OD; 2 7/16″ lg x 1 3/16″ wd x 1/8″ thk; rectangular shape, bakelite body; 3/16″ ID opening; five 1/8″ diam csk holes on irregular ctr for mtg; cont marked 1 to 9; Lewyt part/dwg #VT–0205–L.	Receptacle marked RECEIVER-POWER SOCKET on the back of the transmitter chassis.	2Z9409.66
	*	*	CORE, adjustable tuning: gear rack core assem and tuning; c/o 2 iron cofes 72 gear rack; powdered iron core, brass gear rack; rectangular gear rack; round core; 1 13/16″ lg x 9/16″ diam core, 2 3/8″ lg x 5/16″ sq rack, 4 1/4″ lg o/a; gear rack travels on gear assem 1 end, core travels in coils other end; u/w coil assem ref symbol T110, 13 teeth ea gear rack; Lewyt part/dwg #VG–1992–L.	Adjustable iron core for antenna coils T110A and T110B.	2Z3262–34
	*	*	GEAR ASSEMBLY: ant tuning; c/o 2 gears, shaft, bkt coupling, stop pin, washers, set screw, and 2 springs; brass gears, steel cas pl shaft, steel cad pl bkt, steel springs; round shape; 2 1/2″ lg x 3/4″ diam; mtgs by bkt; 10 teeth ea gear; Rauland dwg #VG–1952–A.	Part of iron core tuning assembly for coils T110A and T110B.	2Z4875–305

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
		*	INSULATOR, bushing: round; phenolic, wax impr; ⅛″ h; body .1405″ ID x 5/16″ OD w/1/16″ thk x .112″ diam shoulder; Rauland part/dwg #QP–0065.	- - - - - - - - - - - - - - - -	3G1795–15
		*	INSULATOR, bushing: extruded washer type; phenolic, grade XX; ⅜″ OD x .1405″ ID, ⅛″ thk; shoulder 11/64″ OD x 1/16″ h; wax impr; Stupakoff part #0163.	- - - - - - - - - - - - - - - -	3G1838–6.25
R110	*	*	RESISTOR, fixed: WW; 9 ohms ±3%; 5 w; 1″ lg x 5/16″ OD x 3/16″ ID; vitreous E, inductive wnd, ceramic cone; 2 radial solder lug terms 3/16″ wd x ⅜″ lg w/30 deg difference in radial angles; Rauland part/dwg #RW–1900–CB.	V101, V102, and V105 filament-dropping resistor.	3Z5999–10
R121	*	*	RESISTOR, fixed: comp; 8200 ohm ±10%; ½ w; F characteristic; .406″ lg x .175″ diam; ins; RSW and humidity 2 axial wire leads; spec JAN–R–11; JAN type RC20BF822K.	Part of voltage divider supplying screen V102.	3RC20BF822K
R124	*	*	RESISTOR, fixed: WW; 30,000 ohms ±5%; 10 w; 2″ lg x 19/32″ diam; vitreous E, "G" coating; 2 solder lug term; Lewyt part/dwg #RW–2303–L.	Part of voltage divider supplying screen of V103.	3Z6630–112
R122 R123	*	*	RESISTOR, fixed: comp 22 meg ±10%; 1 w; F characteristic letter; 15/16″ diam x ¾″ lg; ins; RSW and humidity; 2 axial wire leads; Erie type #518B.	Indicator I101 ionization voltage supply resistors.	3Z6822–1
X114	*	*	SOCKET, tube: 7 cont, miniature; 1 piece saddle mtg; 2 mtg holes ⅛″ diam on ⅞″ mtg/c; round ceramic body, 1⅛″ lg x .800″ wd x 25/32″ h excluding term; phosphor-bronze silver pl cont; w/shock shield and ctr shield .156″ ID; spec JAN–S–28A; JAN type TSE7101.	- - - - - - - - - - - - - - - -	2Z8677.94
X101 X108	*	*	SOCKET, tube: 7 cont miniature; 1 piece saddle mtg w/sheel for bayonet mtg tube shield; two ⅛″ diam mtg holes on ⅞″ mtg/c; ceramic w/oval type saddle approx 1⅛″ lg x .900″ wd x 13/16″ h incl term; copper base alloy, silver pl cont; marked TSE7T102; w/ctr shield .156″ ID and shock shield; spec JAN–S–28A; JAN type TSE7T102.	- - - - - - - - - - - - - - - -	2Z8677.99
X110 X112	--- *	* *	SOCKET, tube: 8 cont miniature, octal; 1 piece under chassis mtg	- - - - - - - - - - - - - - - -	2Z8678.326

3. Identification Table of Parts for Receiver-Transmitter RT–77/GRC–9—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			w/4 gnd lugs; mts w/2 #6–32 NC 2 female bushings 1.500" C to C; round ceramic body, $1\frac{13}{16}$" lg x $1\frac{7}{64}$" wd x ⅝" h less term; phosphor-bronze silver pl cont; JAN No. stamped on face of body; spec JAN–S–28A; JAN type TSB8T–101.		
S102A through S102F	*	*	SWITCH ASSEMBLY; rotary, ant selector sw, 1 phenolic and 4 ceramic sect; c/o sw, two 10 uuf capacitors, 13 jumper wires between cont on sw sect; 6 pole, 11 position; 1⅞" h x 1⅝" wd x $2\frac{3}{16}$" d from end plate; bushing mtd, ⅜"–32 NS thd x ⅜" lg, shaft, incl bushing $\frac{51}{64}$" lg x $\frac{1}{42}$" diam w/ $\frac{3}{16}$" lg double flat, topped #6–32 x ⅜" d in end, silver alloy cont remaining metal parts cad pl; OAk #X–0175 per Rauland part/dwg #X–0175 and #VG–1987.	Control Ⓐ	2Z9903A–64.1
S103A through S103D	*	*	SWITCH, rotary: 4 pole 3 position; phenolic wafers; $1\frac{15}{16}$" lg x 1½" wd x $\frac{15}{16}$" h less shaft; shorting and nonshorting cont; solder lug term; shaft $\frac{53}{64}$" lg x ¼" diam w/$\frac{3}{16}$" lg flat and #6–32 top in end, bushing ⅜"–32 thd x ⅜" lg; incl bkt; Rauland part/dwg #AG–2541 acts as cable clamp, two 10 uuf ceramic capacitors Rauland part #CC–100–C and 8 jumper wires; Rauland part/dwg #X–0177.	Control Ⓔ	3Z9825–41.11
S105–1, S105–2, S105–3	*	*	SWITCH, rotary: 7 pole, 12 position; 1 phenolic and 1 ceramic wafer; 1⅞" lg x 1⅝" h less shaft and bkt; shorting and non-shorting cont; solder lug term; bushing ⅜"–32 thd x ⅜" lg; shaft $\frac{53}{64}$" lg x ¼" diam w/$\frac{3}{16}$" lg double flat and topped #6–32 in end; incl bkt $1\frac{37}{64}$" h x 1⅞" wd x $\frac{3}{32}$" thk acts as cable clamp, used as dual 6 position sw; Rauland part/dwg #X–0178.	Control Ⓓ	3Z9825–41.10
S101A through S101N	*	*	SWITCH, rotary: band change sw for transmitter; c/o sw, capacitors, resistors, shaft, bkt; and "O" ring; 5 ceramic and 4 bakelite wafers; 8" lg x 2¼" h x 3¾" wd incl shaft; mts by bushing ⅜"–32 x $\frac{25}{64}$" lg and 1 mtg ft w/2 holes .144" diam, ¾" mtg/c; Rauland part/dwg #VG–2025.	Control Ⓕ	3Z9903A–64

4. Identification Table of Parts for Vibrator Power Unit PE–237

Notes. 1. Those parts having asterisks in column 1 are procured on orders No. 22375–P–44, 724–MPD–44, 19395–P–44, 29395–P–44, 53906–P–45, 29129–P–45, and 17682–P–45.

2. Those parts having asterisks in column 2 are procured on orders No. 9157–P–46–02, 9157–P–46, and 10250–P–49.

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			VIBRATOR POWER UNIT PE–237: nonsynchronous; output 525 v DC, 95 ma; 105 v DC, 42 ma, 6.5 v DC, 2 amp, 6 v DC, 500 ma, 100 v DC, 17 ma and 2 output circuits 1.35 v DC, 450 ma, input 6 v DC, 36 amp, 12 v DC, 17 amp or 24 v DC, 9.5 amp; 20 3/16" lg x 11" wd x 9 15/16" d; Sig C spec 71–1606.	Supplies power to the receiver-transmitter.	3H6800–237
	*	*	TECHNICAL MANUAL (TM 11–230–C).		(Order through AGO channels)
	*	*	BEARING, sleeve: metal; 25/64" ID, 1 13/32" lg x ⅝" OD; 9/64" lg x .437" OD; shoulder ea end; Rauland part/dwg #BG–0661.	Part of shock mount	3H3211–11
	*	*	BOARD, terminal: 3 metal solder term; phenolic; 2¼" lg x 1⅛" wd x ⅛" thk o/a; stenciled "1, 2, 3" in black; Rauland part/dwg #VT–0091.	General purpose binding post strip.	3Z9403.97
	*	*	BOARD, terminal: 3 metal solder lug term; phenolic; 2⅛" lg x ½" wd x ⅛" thk; term extend ⅜" ea side of board; Rauland part/dwg #VT–0110.	General purpose binding post strip.	2Z9403.99
	*	*	BOARD, terminal: 9 metal screw term; bakelite; 4" lg x ⅞" wd x 13/32" thk o/a; stenciled "20, 21, 22, 23, 24, 32, 33, 34, 35" in white; Jones HB #9–140; Rauland part/dwg #VT–0100.	Output terminal board	2Z9409.30
	*	*	BOARD, terminal: 13 metal solder lug term; phenolic; 6¼" lg x ½" wd x ⅛" thk; term extend 7/16" ea side of board; Rauland part/dwg #VT–0111.	General purpose binding post strip.	2Z9413.16
	*	*	BOARD, terminal: 24 metal solder lug term; phenolic; 6⅛" lg x 2¼" wd x ⅛" thk; stamped "705–1 to 705–12" inclusive; Rauland part/dwg #VT–0112.	General purpose binding post strip.	2Z9424–18
	*	*	BUSHING, threaded: metal; ⅞"–14 female thd; hex 1" across flats x ⅜" lg; Rauland part/dwg #BG–0502; (p/o housing bottom).	For gripping battery input cables.	3H6800–237/A2
	*	*	BUSHING, threaded: metal; ⅞"–14 x ⅝" lg male thd; hex 1" across flats x ¾" lg o/a; Rauland part/dwg #BG–0501; (p/o housing bottom).	For gripping battery input cables.	3H6800–237/A1

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	CABLE ASSEMBLY, power: battery; neoprene jacket; round, .580″ OD; 60″ lg; single #4 AWG stranded cond; w/battery lug 1 end, solder lug other end; Rauland part/dwg #VW–0173.	Battery input cables	3E7173–1
739–1, 739–2	------	*	CAPACITOR, fixed: paper; 20,000 uuf ±10%; 1000 vdcw; HS metal case, $1\frac{11}{16}$″ lg x $\frac{11}{16}$″ diam; mineral oil impr JAN type CP26A–1EG203K.	Tube 1006 filament filter capacitors.	3DA20–193
706	*	------	CAPACITOR, fixed: paper; mineral oil filled; 450,000 uuf +14% –6%; 120 vdcw; body dimen $1\frac{13}{16}$″ lg x $\frac{11}{16}$″ diam, mtg bkt ea end; Gudeman Mfg #7265; Chicago Condenser Co #503; Rauland Special #CO–454.	Battery input r-f bypass	3DA450–2
716–1 through 716–5	*	*	CAPACITOR, fixed: paper; castor oil filled; 1.25 uf +14% –6%; 100 vdcw; body dimen $1\frac{25}{32}$″ lg x $1\frac{9}{32}$″ wd x ⅞″ thk, w/2 solder lug standoff term on 1 side; Rauland part/dwg #CO–125A; Crosley part/dwg #W–226593.	Vibrator VB–16 buffer capacitors.	3DB1A25–2
714–1, 714–2	*	*	CAPACITOR, fixed: paper; castor oil filled; 2 sect; 3.5 uf 500,000 uuf +14% –6%; 1,000 vdcw; body dimen 4¼″ h x $1\frac{3}{16}$″ thk x 2½″ wd, w/3 standoff term; Gudeman Mfg #7249; Chicago Condenser Co #514; Rauland Special #CO–405–H.	Transmitter power amplifier plate supply filter capacitors.	3DB3A5–2
715	*	*	CAPACITOR, fixed: paper; 4 uf ±10%; 1,000 vdcw; HS metal case; body dimen 2½″ lg x $1\frac{3}{16}$″ wd x 4¾″ h; castor oil filled; JAN type CP70E1DG405K.	Transmitter power amplifier plate supply filter capacitor.	3DB4–275
707–1, 707–2, 707–3	*	*	CAPACITOR, fixed: electrolytic; 3 sect; 40–40–80 uf +40% –10%; 300–300–50 vdcw; 3 solder lug term on bottom; 3″ lg x 1⅜″ diam; Mallory type #FP.	701–1: Keying relay supply circuit filter. 707–2 and 707–3: Stand-by rectifier B+ voltage output filters.	3DB80–2
708–1, 708–2	*	*	CAPACITOR, fixed: electrolytic; 2 sect; 500–500 uf +40% –10%; 2 solder lug term on bottom; 25 vdcw; 3″ lg x 1⅜″ diam; Mallory type #FP.	Receiver filament supply circuit filters.	3DB500–14
712–1, 712–2	*	*	CAPACITOR, fixed: electrolytic; 2 sect; 1,250–1,250 uf +40% –10%; 2 solder lugs on bottom; 10 vdcw; 3″ lg x 1⅜″ diam; Mallory type #FP.	Transmitter filament supply circuit filters.	3DB1250
728	*	*	CIRCUIT BREAKER: solenoid type; SP; 6 v, 112 amp ±20%; 12 v, 56 amp ±20%; 24 v, 28 amp	ON-OFF switch and circuit breaker.	3H900–35–10

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref. symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			±20%; metal case; 2 11/32" lg x 2 7/16" wd x 1 15/16" thk o/a; GM Corp #12997F.		
	*	*	CLAMP: tube; metal springs; 1 bolt mtg; ⅞" lg x 13/16" wd x 3/32" thk; Rauland part/dwg #AG–0318; Crosley part/dwg #W–227338.	----------------------------	2Z2626.14
	*	*	CLAMP: vibrator; metal; spring cup type; 1⅛" ID, 1⅝" OD x 9/16" h less mtg ears; Cinch #52035.	----------------------------	6Z7861
704	*	*	COIL, AF: driving coil reactor; single wnd 6.06 mh; .55 amp, 3.66 ohms DC resistance; 2¼" h x 1½" diam; Crosley part/dwg #W–226636; Rauland part/dwg #VG–1206.	Vibrator VB–16 driving coil supply circuit choke coil.	3C323–34W
703	*	*	COIL, AF: filter choke; single wnd; .1 hy; 450 ma, 7.4 ohms DC resistance; 3½" lg x 1½" d x 2" wd o/a; Sola Elec #742–029.	Receiver filament supply circuit choke.	3C323–34C
725–1, 725–2, 725–3	*	*	COIL, RF: choke; single pie wnd; unshielded; 750 uh, 150 ma, 10 ohms DC resistance; 25/32" diam x 1⅛" lg; Crosley part/dwg #C–226809; Rauland part/dwg #LC–0126.	Tube 1006 chokes for h-v d-c hash suppression.	3C323–34E
705–1 through 705–15	*	*	COIL, RF: filter choke; single conical wnd; unshielded; 10 uh, 7 amp, .020 ohm DC resistance, #16 double E wire; 1" diam x 9/16" thk; Ensign Coil #1544.	R-f chokes for hash suppression from Vibrators VB–1 and VB–16.	3C323–34D
734	*	*	CONNECTOR, female contact: 9 round pol cont; straight; body 1.480" diam x 31/32" h less term, fl 1 57/64" diam x .062" thk; Rauland part/dwg #SF–0142.	Power output receptacle----	2Z3070–40
732	*	*	CONNECTOR, female contact: 17 round cont; straight; 2¾" x 2¾" x ⅜" thk less term; Crosley part/dwg #C–226776; Rauland part/dwg #QP–0156.	Vibrator VB–16 socket------	2Z8687–3
	*	*	FASTENER, latch: for bottom case, metal; 1½" lg x 19/32" wd x 1½" d o/a; Corbin Lock Co #51794B, less spring.	----------------------------	6Z3810–67
	*	*	GASKET: channel type; rubber; water sealing for cover; 13/32" sq x 60" lg o/a; Rauland part/dwg #QR–0105.	----------------------------	3H2154.12–1
	*	*	GASKET: molded; rubber; 2 11/16" lg x 1⅞" wd x ¼" thk o/a w/2 recesses for push buttons; Crosley part/dwg #W–226294; Rauland part/dwg #QR–0053.	Covers ON-OFF push buttons.	2Z4868.58

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	GASKET: rectangular; cork; vibrator; 7⅛″ lg x 4″ wd x 1⁄32″ thk; Felt Prod part #X–3041.	----------------------------	3H2154.16
	*	*	GASKET: rectangular; rubber; for shockmount panel; 15¾″ lg x 1¾″ wd x 1⁄32″ thk; Rauland part dwg #QR–0085; Crosley part/dwg #C–226999.	----------------------------	3H6800–237/G3
	*	*	GASKET: ring; rubber; 7⁄16″ ID, ⅝″ OD x 3⁄32″ thk; Victor Gasket #AN–6227–9.	----------------------------	3H6800–237/G6
	*	*	GASKET: washer type; rubber; for #10 screw; 3⁄16″ ID, ⅜″ OD x 1⁄32″ thk; Crosley part/dwg #W–226291; Rauland part/dwg #QR–0023.	----------------------------	2C5395–1306/G13
	*	*	GASKET: washer type; rubber; weatherseal; 3⁄16″ ID, ⅝″ OD x 5⁄64″ thk; Rauland part/dwg #QR–0090; Crosley part/dwg #W–226304.	----------------------------	3H6800–237/G4
	*	*	GASKET: washer type; rubber; ⅞″ ID, 1 1⁄16″ OD x 1⁄32″ thk; Rauland part/dwg #QR–0070; Crosley part/dwg #W226308.	----------------------------	3H6800–237/G1
	*	*	GASKET: washer type; rubber; for socket assem; 1⅜″ ID, 1 15⁄32″ OD x 3⁄16″ thk; Rauland part/dwg #QR–0087; Crosley part/dwg #W–226298.	----------------------------	3H6800–237/G7
	*	*	GASKET: washer type; rubber; for socket; 1½″ ID, 1⅞″ OD x 1⁄16″ thk; Rauland part/dwg #QR–0088; Crosley part/dwg #W–226287.	----------------------------	3H6800–237/G8
	*	*	GASKET: washer type; rubber; 2 1⁄32″ ID, 2 9⁄16″ OD x 1⁄16″ thk; Crosley part/dwg #W–226302; Rauland part/dwg #QR–0089.	----------------------------	3H6800–237/G5
	*	*	GASKET: washer type; rubber; ¼″ ID, ¾″ OD x 1⁄16″ thk; Rauland part/dwg #QR–0108; Crosley part/dwg #W–226466.	----------------------------	6Z4174–11
	*	*	INSULATOR, bushing: extruded washer type; phenolic; .147″ ID. ⅝″ OD x ¼″ thk o/a; 9⁄32″ OD x ⅛″ h; Rauland part/dwg #AC–0443; Crosley part/dwg #W–226285.	----------------------------	3G1837–8.20
	*	*	KNOB: lever; metal; for ¼″ shaft; double #8–32 Allen head set screws; 1¾″ lg x ⅝″ wd x ½″ h o/a; Crosley part/dwg #B–226482; Rauland part/dwg #VG–1024.	----------------------------	2Z5844–20

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
		*	LATCH, fastener: steel; approx $2\frac{1}{16}$" lg x $1\frac{15}{32}$" wd x $\frac{15}{32}$" h o/a; two .051 music wire tension spring; Corbin Cabinet Lock Co #15821; Rauland part/dwg #AG–2186.	------------------------	6Z6918–8
	*	*	MOUNT, vibration: cylindrical; rubber, p/o shockmount; ⅝" ID, ⅞" OD x $1\frac{3}{16}$" thk; Crosley part/dwg #W–226301; Rauland part/dwg #QR–0083.	------------------------	2Z8408–11
	*	*	MOUNT, vibration: cylindrical; rubber; p/o shockmount; ⅞" ID, 1¼" OD x ½" thk; Rauland part/dwg #QR–0082; Crosley part/dwg #W–226307.	------------------------	2Z8408–12
	*	*	MOUNT, vibration: rectangular; 80 lb load rating; $20\frac{3}{16}$" lg x 1¾" wd x 1½" h; Rauland part/dwg #VG–1142; Crosley part/dwg #C–227000.	------------------------	2Z8408–3
729	*	*	RECTIFIER, metallic: selenium; input 7.5 v AC, 200 cyc; output 6.5 v DC; 2 amp; round body 3¼" diam x 1⅜" thk less mtg bkt; Fansteel Metallur #Q–10537; Rauland part/dwg #JR–0009.	Transmitter filament supply circuit rectifier.	3H4858–8
727	*	*	RELAY, armature: SPST; normally open; 1⅞" h x 1⅝" wd x $1\frac{7}{16}$" thk o/a; GM Corp #12995–1.	Puts stand-by section into operation.	2Z7599–38
726	*	*	RELAY, armature: 3PDT; 2" h x 1⅝" wd x $1\frac{7}{16}$" thk o/a; GM Labs #12996–1.	Determines whether stand-by or heavy duty section is placed into operation.	2Z7591–9
724	*	*	RESISTOR, adjustable: WW; 1 ohm ±20%; 10 w; adj slider on top; body dimen 1¾" lg x $\frac{7}{16}$" diam; Utrad #X–1320.	Transmitter, filament supply circuit, voltage adjustment.	3Z5991–53
717	*	*	RESISTOR, fixed: WW; 36 ohms ±5%; 10 w; tapped at 12 ohms; body dimen 1¾" lg x $\frac{7}{16}$" OD; Utrad #X–1322A.	Transmitter keying relay dropping resistor.	3Z6003F6–5
719	*	*	RESISTOR, fixed: WW; 46.31 ohms ±5%; 50 w; tapped at 3.6 ohms, 2.71 ohms, 13.3 ohms, and 26.7 ohms; body dimen 4" lg x $\frac{11}{16}$" diam; Utrad #X–1318.	Receiver filament dropping resistor.	3Z6004F6
718	*	*	RESISTOR, fixed: WW; 90 ohms ±5%; 10 w; tapped at 30 ohms; body dimen 1¾" lg x $\frac{7}{16}$" diam; Utrad #X–1323A.	Relay 726 dropping resistor.	3Z6009–5
720	*	*	RESISTOR, fixed: WW; 100 ohms ±5%; 10 w; tapped at 35 ohms; body dimen 1¾" lg x $\frac{7}{16}$" diam; Utrad #X–1321A.	Vibrator VB–1 dropping resistor.	3Z6010–129
	*	*	SHELL, connector: fl type; fl $2\frac{9}{16}$" x $\frac{1}{16}$" thk; body 1.906" diam x	------------------------	2Z8276–40

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			¾" thk; Rauland part/dwg #AG–1596; Crosley part/dwg #B–226558.		
	*	*	SHIELD, tube: round; 3 embossed catch mtg; inside dimen 4⅛" lg x $1\frac{29}{32}$" diam; outside dimen $4\frac{3}{16}$" lg x $1\frac{31}{32}$" diam; top hole $1\frac{9}{32}$" diam; Rauland part/dwg #JS–0065; Crosley part/dwg #B–226420.	----------------------------	2Z8307–4
733	*	*	SOCKET, tube: 4 prong, ring mtg type; ceramic; 1¼" diam x $\frac{25}{32}$" thk; Amphenol #SS–4; Rauland part/dwg #ST–406A.	Tube 1006 socket----------	2Z8674.85
731	*	*	SOCKET, tube: 4 prong wafer type; bakelite; 1⅞" lg x 1⅜" wd x ⅛" thk less term; Cinch #X–15.	Vibrator VB–1 socket------	2Z8674.71
730	*	*	SOCKET, tube: octal ring mtg type; bakelite; 1¼" diam x $\frac{13}{16}$" thk; Amphenol #SS–8.	Tube 1005 socket----------	2Z8762.2
	*	-----	SPRING: lock; .070" diam music wire; catch for fastener; $1\frac{19}{32}$" lg x $1\frac{7}{16}$" max wd; Rauland part/dwg #AG–0755; Crosley part/dwg #W–226372.	----------------------------	3H5280–6
	*	*	SPRING: compression; 5 turns spring steel wire; retainer for tube shield; $2\frac{1}{16}$" max diam x $1\frac{5}{16}$" lg; Rauland part/dwg #AG–1604; Crosley part/dwg #W–226411.	----------------------------	2Z8878–32
	*	*	STUD: metal; $2\frac{11}{64}$" lg x ¼" diam; 1 end ¼"–20 x $1\frac{5}{16}$" lg thd, other end ¼"–20 x ¾" lg thd; Rauland part/dwg #BG–0594; Crosley part/dwg #W–226387; (p/o battery terminal).	----------------------------	6L31233–1M
735–1A, 735–1B, 735–1C, 735–2A, 735–2B, 735–2C, 735–3A	*	*	SWITCH, rotary: 9 pole, 3 position; 3 bakelite wafers; body 1⅞" lg x $1\frac{9}{16}$" wd x $1\frac{5}{16}$" d; bushing ⅜"–32 x ¼" lg thd; front shaft $\frac{9}{16}$" lg x ¼" diam, rear shaft double "D" $4\frac{9}{16}$" lg; Oak #26871–H3.	Voltage change switches	3Z9825–62.91
735–4A, 735–4B, 735–4C, 735–5A, 735–5B, 735–5C, 735–6A, 735–6B, 735–6C, 735–7A, 735–7B, 735–7C,	*	*	SWITCH, rotary: 15 pole, 3 position; 5 bakelite wafers; body 1⅞" lg x $1\frac{9}{16}$" wd x 2⅛" d; no shaft, operated by double "D" shaft ext on ref symbol 735–1, 2, 3; Oak #26871–H5.	Voltage change switches---	3Z9825–41.3

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref. symbol	Model designation Col. 1	Model designation Col. 2	Name of part and description	Function of part	Signal Corps stock No.
735–8A, 735–8B, 735–8C					
738	------	*	TRANSFORMER; power: filament type; pri 6/12/24, v, 200 cyc; secd #1, 75 v RMS, 21 amp; HS metal case; body dimen 3 7/32" lg x 3" wd x 2⅞" h; Rauland part/dwg #LP–0176.	Tube 1006 filament transformer.	2Z9614–194
700–1, 700–2, 700–3, 700–4	*	*	TRANSFORMER, power: transmitter pl supply; pri 6/12/24 v, 200 cyc; secd #1, 120 v, 150 ma, secd #2, 120 v; 150 ma; secd #3, 11 v, 450 ma; fully encl metal case; 3¼" lg x 3 1/16" wd x 2⅞" thk; Sola Elec #722–014.	Heavy duty section power transformers.	2Z9625–17
702–1, 702–2, 702–3, 702–4	*	*	TRANSFORMER, power: vibrator transformer and choke assem; transformer pri 6/12, 24 v, 90 cyc, secd #1, 240 v, 17 ma, CT, secd #2, 6 v, 100 ma, chokes ref symbol #702–4 is 15 hy, 17 ma, #702–3 is .6 hy, #702–2 is 30 mh 2 amp; fully encl metal case; 4⅞" lg x 2½" wd x 3⅜" h; Sola Elec #791-000.	702–1: Stand-by section power transformer. 702–2: Transmitter filament supply circuit choke. 702–3: Transmitter plate voltage supply circuit choke. 702–4: Receiver plate voltage supply circuit choke.	2Z9619–72 2Z9619–72
701	*	*	TRANSFORMER ASSEMBLY: v regulator; transformer-capacitor type; regulates fil v; pri 37–73 v, 200 cyc; secd #1, 14 v, 2 amp CT, secd #2 has 500,000 uuf capacitor connected across it; iron core fully encl steel case transformer, oil filled paper capacitor and instruction sheet; transformer case 4¾" h x 3⅜" wd x 2 7/16" d, capacitor body 2¾" h x 1¾" wd x 1" thk w/2 binding post term ⅞" h; Rauland part/dwg #LP–0121 and #D–228426.	Transmitter filament supply voltage regulator transformer.	2Z9617–71
1005	*	*	TUBE, electron: JAN–1005	Stand-by circuit rectifier tube.	2J1005
1006	*	*	TUBE, electron: JAN–1006	Heavy duty circuit rectifier tube.	2J1006
VB16	*	*	VIBRATOR VB-16: nonsynchronous; input 6 v DC, 35 amp, 12 v DC, 17 amp, 24 v DC, 8 amp; rectangular zinc can; 5½" lg x 2¾" x 2¾" less term; 17 male banana pin plug-in type base; Rauland part/dwg #JV–0014; Croslev part/dwg #D–226857.	Heavy duty section vibrator.	3H6694–11

4. Identification Table of Parts for Vibrator Power Unit PE–237—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
VB1	*	*	VIBRATOR, nonsynchronous: input 6 v DC, 150 ma; tubular metal can; 1½" diam x 2⅞" h less pin base; std 4 pin plug-in base; Oak #V–6460–17XS.	Stand-by section vibrator__	3H6691–15
	*	*	WRENCH: set screw; "L" shaped; 1¾" lg, short arm 45/64" lg x 5/64" across flats; hex shaped for #8 set screw; Allen #8.	----------	6R57400
			ADDITIONS		
		*	WIRE, electrical: ins; single #4 AWG stranded cont, 49 strands of #20 copper wire and 9 strands of #27 steel wire.	----------	1B804.15
736	*	*	CAPACITOR, fixed: paper; 50,000 uuf ±10%; 1,000 vdcw; JAN type CP26A1EG503K.	Heavy duty section B+ supply lead r-f bypass.	3DA50–361
710–1 through 710–16	*	*	CAPACITOR, fixed: paper; 50,000 uuf ±10%; 600 vdcw; JAN type CP26A1EF503K.	Vibrators VB–16 and VB–1 contacts r-f bypasses.	3DA50–224
713	*	*	CAPACITOR, fixed: paper; 500,000 uuf +7% –4%; 750 vdcw; Lewyt part/dwg #CO–504P–L.	Voltage regulator transformer 701 tuning capacitor.	3DA500–728
711	*		CAPACITOR, fixed: paper; 500,000 uuf ±10%; 200 vdcw; JAN type CP54B1EC504K.	Vibrator VB–1 buffer capacitor.	3DA500–639
709–1, 709–2	*	*	CAPACITOR, fixed: 1 uf +20% –10%; 600 vdcw; JAN type CP53B4EF105V.	Vibrator VB–16 driving contact spark suppressors.	3DB1–186
723–1 through 723–5	*	*	RESISTOR, fixed: WW; 15 ohms ±20%; 5 w; Utrad part #X–1293.	Vibrator VB–16 buffer resistors.	3Z6001E5–24
743	------	------	RELAY: SPST contacts; 24 v wnd	Time delay relay for shorting surge resistor 740.	2Z7598–146
740	------	------	RESISTOR, fixed: 3.1 ohms -------	Absorbs initial current surge on 24-volt operation.	3RW9329
741	------	------	CAPACITOR, fixed: 1.25 uf ------	Lessens sparking across driving contacts of Vibrator VB–16.	3DB1A25–2
737	*	*	RESISTOR, fixed: comp; 1000 ohms ±10%; ½ w; JAN type RC20–BF102K.	Stand-by section receiver plate supply dropping resistor.	3RC20BF102K
721–1, 721–2	*	*	RESISTOR, fixed: WW; 5000 ohms ±5%; 50 w.	Heavy duty section receiver plate supply dropping resistors.	3Z6500–277
722–1, 722–2	*	*	RESISTOR, fixed: comp; 27,000 ohms ±10%; 2 w; JAN type RC42BF273K.	Heavy duty section B+ supply, filter capacitor discharge resistors.	3RC42BF273K

5. Identification Table of Parts for Generator GN–58–(*)

Notes. 1. Those parts having asterisks in column 1 are procured on orders No. 17360–P–44–06, 19395–P–44–05, 22375–P–44–05, 17682–P–45, and 34315–P–45.

2. Those parts having asterisks in column 2 are procured on orders No. 9157–P–46–02, 9157–P–46–02, and 10250–P–49.

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			GENERATOR GN–58: DC; 425 v, .115 amp, 105 v, .035 amp, 6.3 v, 2.45 amp, 1.4 v, .45 amp; closed; 11" lg x 8" wd x 8¼" h o/a; hand-cranked; contains Socket SO–141; uses Legs LG–2, LG–3 and Crank GC–7; Sig C spec 71-3017.	Supplies power to the receiver-transmitter.	3H2358
	*	*	BEARING ASSEMBLY, sleeve; coupling; left; o/a dimen, w/brg seal assem open, 4¾" lg x $2\frac{5}{16}$" wd x $1\frac{5}{32}$" thk; incl pin, spring, brg bell, felt gasket, brg seal, oilite brg, retainer, stud, and thumbnut; Warwick part/dwg #US–84134; Rauland part/dwg #VG1325.	------	3H2358/P8
	*	*	BEARING ASSEMBLY, sleeve: coupling; right; o/a dimen, w/brg seal assem open, 4⅛" lg x 2⅞" wd x $1\frac{7}{16}$" thk; incl pin, spring, brg bell, felt gasket, brg seal, oilite brg retainer, stud, and thumbnut; Warwick part/dwg #US–84133; Rauland part/dwg #VG1324.	------	3H2358/P7
	*	------	BRUSH SET, electrical contact; HV, Morganite grade #HM–6782; $1\frac{9}{64}$" lg x .089" thk x .275" wd o/a; complete w/spring, pigtail, and cap; 2 per set; Pioneer #AS–B–6008, #AS–B–6008–1.	------	3H525–97
235	------	*	BRUSH SET: electrical cont; c/o 2 HV brushes; grade #HM6782 carbon; ea brush ½" lg x ¼" wd x $\frac{3}{32}$" thk; 1" pigtail, spring, and spring cap; 1 brush marked "+"; 1 brush marked "–"; Rauland part/dwg #AG–1721.	Makes contact to h-v commutator.	3H2358/B6
236	------	*	BRUSH SET: electrical cont; c/o 2 LV brushes: grade #CM6210 carbon; ea brush $\frac{19}{32}$" lg x .262" wd x .188" thk; 1" pigtail, spring, and spring cap; 1 brush marked "+"; 1 brush marked "–"; Rauland part/dwg #AG1720.	Makes contact to l-v commutator.	3H2358/B5
	*	------	BRUSH SET, electrical cont; LV; Morganite grade #CM6210; $1\frac{18}{32}$" lg x .188" thk x .262" wd o/a complete w/spring, pigtail, and cap; 2 per set; Pioneer #AS–B–6017, #AS–B–6017–1.	------	3H525–99

5. Identification Table of Parts for Generator GN–58–(*)—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	CAP, contact brush: bakelite, w/brass insert; tapped 7/16"–27; screwdriver slot; 11/16" diam x 5/8" thk; Pioneer #A–5009–B, Warwick dwg #US–6317; Rauland part/dwg–AG1722.	------	3H2358/C1
241	*	------	CAPACITOR, fixed: paper; 100,000 uuf ±10%; 200 vdcw; 1 7/16" x 3/4" x 3/8"; Micamold #345–21.	Suppresses r-f disturbance and sparks from regulator contacts.	3DA100–329
	*	------	CAPACITOR, fixed: paper; 2 uf +20% –10%; 600 vdcw; 2" sq x 1 1/8" thk; JAN type CP50B1EF–205V.	H-v filter capacitor ------	3DB2–59
231	*	------	CAPACITOR, fixed: electrolytic; 250 uf +100% –10%; 10 vdcw; 2" lg x 3/4" diam; Dubilier #BRG; Warwick dwg #US–18280.	L-v filter capacitor ------	3DB250–3
		*	CHAIN: 3–4 link, 3/16" pitch x 7/32" wd, side fl; steel; 60 links, 11 1/4" lg; Rauland part/dwg #AG–1725.	------	3H2358/C15
		*	CHAIN: 5–6 links; 3/16" pitch x 1/32" wd, side fl; steel; 58 links, 10 7/8" lg; Rauland part/dwg #AG–1724.	------	3H2358/C16
226	*	*	COIL, RF: choke; single wnd; pie wnd; unshielded; 12 uh 2.9 amp, .03 ohms DC resistance; 1" x 21/32" lg o/a; Radionic Controls #0101; Rauland part/dwg #LC–0133.	Transmitter filament r-f hash choke.	3C323–34X
225	*	*	COIL, RF: choke; single wnd; multilayer wnd; cylindrical zinc can; 28 mh; .45 amp, 10.2–10.9 ohms DC resistance; 1 3/4" lg x 1 3/8" diam; Radionic Controls #M101; Rauland part/dwg #LC–0134.	Receiver filament filter choke.	3C575K–1
228–1, 228–2	*	*	COIL, RF: choke; 4 pie wnd; 530 uh ±5%, 150 ma; 7 ohms DC resistance; 2" lg x 11/16" diam; Guthman per Warwick dwg #US–841128.	Transmitter plate supply circuit r-f choke.	3C323–34Y
240	*	------	CONNECTOR, female contact: 9 round pol cont; straight; 1.896" diam x 1 1/8" lg o/a; Warwick #US–6837; Rauland dwg #SF–0145.	Output power receptacle ------	2Z3070–3
	*	------	COUPLING, rigid: mach steel, isolated by Acadia synthetic #N–187–15 neoprene; dull nickel finish; 1 5/8" diam x 1 9/16" lg w/3/8" sq broached hole in driver brg shank; Warwick part/dwg #US–84157.	------	3H2690.1–3
		*	COUPLING, flexible: drive, mach steel, nickel pl; 1 9/16" lg x 1 5/8" diam; driver brk shank 1" lg x 3/4" diam w/sq broached hole, driven sect 4 lugs star shaped 5/16" thd,	------	3H2358/C30

5. Identification Table of Parts for Generator GN–58–(*)–*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
			7⁄16″ sq broached hole; Rauland part/dwg #VG1323 or #VG–1370.		
	*	-------	DRIVE, generator: gear and chain; magnesium, low metal alloy R; Dow #7 dichromate finish; 6⅛″ h x 5⅞″ d x 7 33⁄64″ wd; Warwick part/dwg #US–84140 less items No. 20, 21, 23, 35, 36.	----------------------------	3H1500.1
	*	*	FASTENER, latch: cover; bonderized steel, olive drab; 1 5⁄16″ wd x 2⅜″ lg x 9⁄16″ thk; Amer Cabinet Lock Co #WX–6889; Warwick dwg #US–83341; (holds down top to bottom cover); Rauland part/dwg #AG–1723.	----------------------------	6Z3810–26
	*	-------	GASKET: asbestos; #231 BT compressed sheet packing; for studs; .194″ ID, 5⁄16″ OD x 1⁄64″ thk; Warwick #US–2821.	----------------------------	6L35033–2
	*	*	GASKET: asbestos; #231 BT compressed sheet packing; for left bell; 1⅜″ ID, 2 5⁄16″ OD x 3⁄64″ thk; Warwick part/dwg #US–2819; Rauland part/dwg #AC–0702.	Left coupling bearing assembly to generator case seal.	3H2358/G7
	*	*	GASKET: asbestos; #231 BT compressed sheet packing; for right bell; 1¾″ ID, 2⅞″ OD x 3⁄64″ thk; Warwick part/dwg #US–2816; Rauland part/dwg #AC–0703.	Right coupling bearing assembly to generator case seal.	3H2358/G9
	*	*	GASKET: asbestos; #231 BT compressed sheet packing; connector ring; 1 33⁄64″ ID, 1 29⁄32″ OD x .015″ thk; Warwick #US–2817; Rauland part/dwg #AC–0706.	To seal joint between generator case and receptacle.	3H2358/G6
	*	*	GASKET: asbestos; #231 BT compressed sheet packing; connector shell; 2″ ID, 2 9⁄16″ OD x 1⁄16″ thk; Warwick #US–2820; Rauland part/dwg #AC–0705.	To seal joint between generator case and receptacle.	3H2358/G8
	*	*	GASKET: rubber; tubular, vulcanized endless; cover seal; 1⁄16″ ID, ⅛″ OD x 27⅞″ lg continuous; Warwick part/dwg #US–288; Rauland part/dwg #OR–0097.	To seal joint between generator case and cover.	3H2358/G1
	*	-------	GASKET: synthetic rubber; freeze resistant; for left and right seal assem; ⅞″ ID x 1 1⁄16″ OD x 9⁄64″ thk; Warwick part/dwg #US–83350.	Water seal generator crank hole.	3H2358/G11
	*	-------	GASKET: synthetic rubber; black, freeze resistant; seal for connector; 1½″ ID, 2¼″ OD x 13⁄64″ thk, w/1⁄16″ thk web; Warwick part/dwg #US–83351.	----------------------------	3H2358/G10

5. Identification Table of Parts for Generator GN–58–(*)—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	------	GASKET: synthetic rubber; channeled; cover seal; 26" lg continuous x ⅛" thk x 3/16" wd; Warwick part/dwg #US–2822.	------------------------	2Z4867.234
	*	*	GASKET: vellumoid or victorite; seal between generator and chain drive; ⅞" ID, 1½" sq x 1/64" thk; Warwick part/dwg #US–289; Rauland part/dwg #AC–0701; (between generator and generator drive).	------------------------	3H2358/G5
	*	-----	GAUGE TL–127: thickness; 1 end .0006"–.0007"; stainless steel type #438; other end .0156" stainless steel type #302; 1¼" lg x ¾" wd; Sig C spec #SC–A–931.	For adjustment of voltage regulator in early models of Generator GN–58.	6Q45127
	*	*	GEAR: pinion sprocket; 3d stage; X–1335 steel; 16 teeth for 7/32" 3–4 link, side guide; .961" diam x .375" wd x 5/16" diam, broached hole w/2 flats ¼" across; Warwick part/dwg #US–7813; Rauland part/dwg #AG–1732; (for generator drive).	------------------------	3H2358/S18
		*	GEAR: spur; steel; armature driving; straight teeth; 112 teeth; 32 dp amer std 20 deg full lg 7 33/64" lg x 3 9/16" diam w/⅛" sq x 23/64" lg key; Rauland part/dwg #VG–1326.	------------------------	3H2358/G46
		*	GEAR ASSEMBLY: spur; pinion gear and sprocket, steel; shaft 2¼" lg x ⅜" diam; Rauland part/dwg #VG–1327.	Second stage in gear train__	3H2358/G44
		*	GEAR ASSEMBLY: spur; sprocket wheel and sprocket pinion; steel; 1¾" x 3 3/64" x 3 3/64" o/a; Rauland part/dwg #VG–1332.	------------------------	3H2358/G45
		*	GEARCASE: magnesium; 5⅞" wd x 6⅛" h x 3 3/16" d; mts by hole over gear, front brg, and tie bkt; Rauland part/dwg #VG–1328.	------------------------	3H2358/G40
235, 236, 237–1, 237–2	*	*	GENERATOR, DC: 84 w output; dual v, 425 v, .150 amp, and 6.65 v, 3.05 amp; open frame; 6.787" lg less shaft x 4" diam; Pioneer type #SF–20, Warwick #US–383; Crosley #D–227135; Rauland part/dwg #VG–1333.	Supplies unfiltered voltage output.	3H2402A
	*	-------	INSULATOR, washer: #231 BT compressed asbestos sheet packing; .113" ID, ⅜" OD x 1/32" thk; Warwick part/dwg #US–2818; (for mtg screws).	------------------------	6L35032–2

5. Identification Table of Parts for Generator GN–58–(*)—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	MOUNT, vibration: round; 9/16" diam x 1/2" #8–32 x 9/32" stud one end, #8–32 x 13/32" stud other end; Warwick part/dwg #US–83349; (for generator); Rauland part/dwg #QR–0100.	------	3H2358/M10
		*	MOUNTING: female connector; 6 holes .106" diam on 1 23/32" mtg/c; brass dull nickel pl; 2 9/16" OD x 13/16" h; four .144" mtg holes on 2 1/4" mtg/c, 1/4" arrow engraved on edge; 2 9/16" diam fl; Rauland part/dwg #AG–1730.	------	3H2358/S10
		*	PIN, hinge: steel; white nickel pl; 1 9/16" lg x .080" diam; approx 3/16" diam head; Rauland part/dwg #AG–1727.	------	3H2358/P10
227	*	*	REACTOR, filter choke; 3.45 mh; 3 amp; .12 ohms DC resistance; 1,000 vact open frame; 4" lg x 1 1/2" wd x 1" h; Warwick part/dwg #US–33232.	L-v filter choke------	3C575K
	*	------	REGULATOR, voltage: 6.3 v, 3 amp; 13/16" wd x 2" h x 1 1/2" base; Warwick #US–84132.	Compensates for voltage changes due to changes in speed of rotation. Found only on old models of Generator GN–58.	3H4990–6
	*	------	RESISTOR, fixed: comp; 15 ohms ±5%; 3 w; 1" lg x 1/4" diam; Keystone Carbon Co type #LC–061; Warwick #US–60709.	------	3Z6001E5–27
242	*	------	RESISTOR, fixed: WW; 28 ohms ±5%; 10 w; tapped at 25 ohms; 2" lg x 9/16" diam; Warwick part/dwg #US60711.	Voltage regulator coil dropping resistor.	3Z6002H8–7
245	------	*	RESISTOR, adjustable: WW; 10 ohms ±10%; 10 w; 1 3/4" lg x 5/16" diam, vitreous enamel ins; Rauland part/dwg #RW–2100A.	Voltage regulator adjusting resistor.	3Z6001–119
229	*	------	RESISTOR, fixed: WW; 10,000 ohms ±5%; 25 w; 1/2" ID, 3/4" OD x 2" lg; Warwick #60707.	Receiver plate-dropping resistor.	3Z5510.22
		*	RING, retainer: socket coupling ring, brass; nickel finish; 1 17/32" ID, 1 29/32" OD x 5/8" d, threaded 1/4"; 6 mtg holes; Rauland part/dwg #AG–1597.	------	3H2358/R25
		*	SEAL, bearing: freeze resistant; neoprene; 7/8" ID, 1 1/64" OD x 9/64" thk web; Rauland part/dwg #QR–0098.	------	3H2358/G11
		------	SEAL, bearing: freeze resistant; neoprene; 13/64" thk, 1 53/64" OD x 45 deg bevel edge; 1/16" thk web; Rauland part/dwg #QR–0099.	------	3H2358/G10

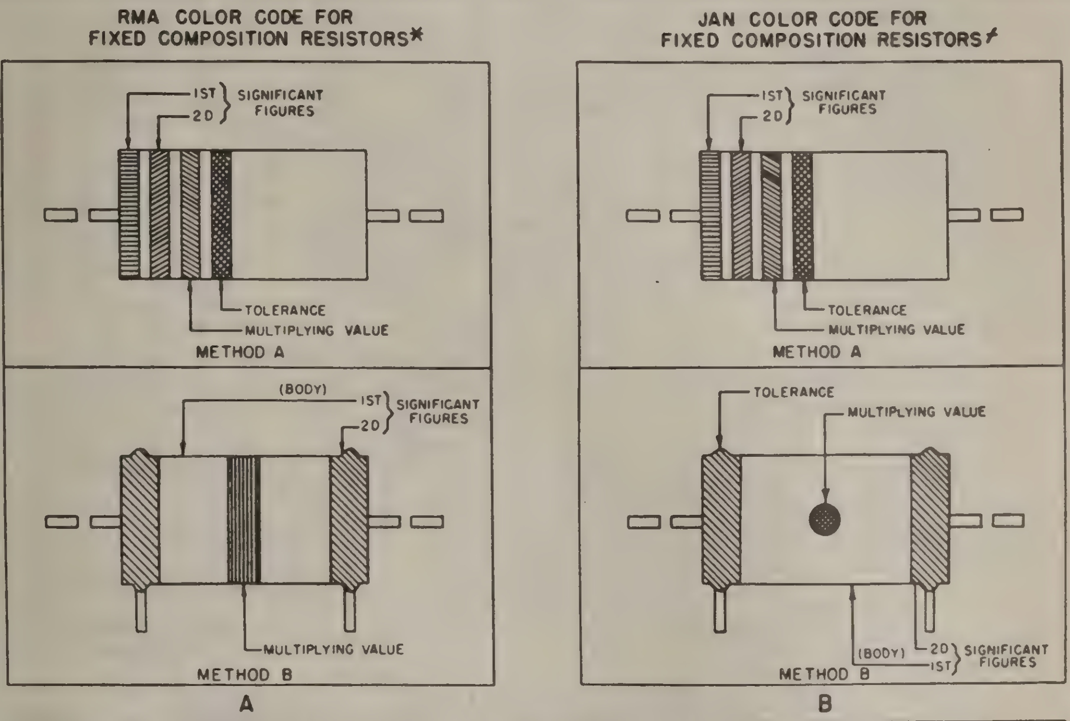
5. Identification Table of Parts for Generator GN–58–(*)—*Continued*

Ref symbol	Model designation		Name of part and description	Function of part	Signal Corps stock No.
	Col. 1	Col. 2			
	*	*	SEAL ASSEMBLY, bearing: left; aluminum; retainer w/neoprene seal; $2\frac{27}{64}$″ lg x $1\frac{3}{8}$″ wd x $\frac{9}{32}$″ thk; Warwick part/dwg #US–84130; (for left coupling brg assem); Rauland part/dwg #VG–1331.	------------	3H2358/R15
	*	*	SEAL ASSEMBLY, bearing: right; aluminum retainer w/neoprene seal; $2\frac{1}{8}$″ lg x $1\frac{3}{8}$″ wd x $\frac{5}{16}$″ thk; Warwick part/dwg #US–84129; (for right coupling brg assem); Rauland part/dwg #VG–1330.	------------	3H2358/R16
		*	SOCKET, octal: 1 piece saddle mtg; round ceramic body; $1\frac{1}{16}$″ diam, barrel type cont; cinch #SS–B; Rauland part/dwg #ST–800P.	Socket for voltage regulator.	2ZK8678.19
	*	*	SPRING, cover: torsion; spring nickel alloy .206″ diam; $\frac{5}{32}$″ ID; .225″ lg w/$\frac{3}{8}$″ lg leads at ends; Warwick part/dwg #US–70135; (for brg seal assem).	------------	3H2358/S15
		*	WASHER, flat: asbestos; round; $\frac{5}{16}$″ OD x .194″ ID x $\frac{1}{64}$″ thk; Rauland part/dwg #AC–0704.	------------	6L35033–2
	*	*	WASHER, flat: brg bronze; $\frac{1}{4}$″ ID, $\frac{9}{16}$″ OD x .091″ thk; Warwick #US–83345; (for pinion wheel and sprocket assem); Rauland part/dwg #WL–0128.	------------	6L53014–1
		*	WASHER, flat: asbestos; round; $\frac{3}{8}$″ OD x .113″ ID x $\frac{1}{32}$″ thk; Rauland part/dwg #AC–0708.	------------	6L35032–2
	*	*	WASHER, flat: brg bronze; .377″ ID, $\frac{11}{16}$″ OD x .072″ thk; Warwick #US–83344; (for pinion gear); Rauland part/dwg #WL–0129.	------------	6L53013–4
	*	*	WASHER, flat: brg bronze; .377″ ID, $\frac{11}{16}$″ OD x .91″ thk; Warwick #US–83342; (for 2d stage sprocket wheel); Rauland part/dwg #WL–0126.	------------	6L53016–1
		*	WASHER, flat: felt; round; 1″ OD x $\frac{23}{32}$″ ID x $\frac{1}{16}$″ thk; Rauland part/dwg #AC–0707.	------------	3H2358/G4
	*	*	WASHER, flat: brg bronze; .502″ ID, $\frac{13}{16}$″ OD x .91″ thk; Warwick #US–83343; (for drive shaft); Rauland part/dwg #WL–0127.	------------	6L53018–1
		*	WASHER, extruded: fiber; .156″ ID, $\frac{3}{4}$″ OD x $\frac{1}{8}$″ thk w/$\frac{7}{16}$″ diam x $\frac{7}{16}$″ shoulder; Rauland part/dwg #WL–0177.	------------	6L50652–3

5. Identification Table of Parts for Generator GN–58–(*)—*Continued*

Ref symbol	Model designation Col. 1	Model designation Col. 2	Name of part and description	Function of part	Signal Corps stock No.
		*	WASHER, flat: fiber; 9/64" ID, ½" OD x ⅛" thk; w¼" diam shoulder; Rauland part/dwg #AC–0709.	--------------------------	6L50522–15
			ADDITIONS		
230		*	CAPACITOR, fixed: paper; 500,000 uuf ±10%; 200 vdcw; max body dimen 1 13/16" lg x 1" wd x ⅞" h; 2 solder lug term on side; JAN type CP53B1EC504K.	Filament circuit hash filter capacitor.	3DA250–534
233–1, 233–2	-------	*	CAPACITOR, fixed: paper; 2 uf +20–10%; 600 vdcw; max body dimen 2" lg x 2" wd x 1⅛" h; 2 solder lug term on side; JAN type CP53B1EF205V.	H-v filter capacitors -------	3DB2–142
240	-------	*	CONNECTOR, receptacle: 9 round female cont; pol; straight type; 1.480" diam x 31/32" h less term; fl 1 57/64" diam x .062" thk; 11 solder lug term on bottom; Rauland part/dwg #SF–0142.	Power output receptacle ___	2Z3070–40
244	-----	*	REGULATOR, voltage: gen voltage regulator; 6 v operation; aluminum regulator can w/bakelite base and built-up bakelite socket assem; regulator 1⅞" lg x 1½" wd x 1¾" h o/a; socket 2" sq x ½" h o/a; "VT–350" stamped on top; Electric Regulator Co type #VT–35–350.	Regulates the output voltage to compensate for changes in cranking speeds and temperature.	3H4990–6.1
		*	SOCKET, tube: std octal; ceramic; 1 13/16" lg x 1⅜" wd x ⅝" thk; mts by metal saddle; JAN type TS–B8T102.	Socket for voltage regulator 244.	2Z8678.327
	*	*	SPRING: flat type; support for Sig C Leg LG–3–B; 1 11/16" lg x 1¾" wd x .025" thk.	--------------------------	3H5255–27

RESISTOR COLOR CODES


RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*
1ST
2D
SIGNIFICANT FIGURES
TOLERANCE
MULTIPLYING VALUE
METHOD A
(BODY)
1ST
2D
SIGNIFICANT FIGURES
MULTIPLYING VALUE
METHOD B
A
JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS†
1ST
2D
SIGNIFICANT FIGURES
TOLERANCE
MULTIPLYING VALUE
METHOD A
TOLERANCE
MULTIPLYING VALUE
(BODY)
2D
1ST
SIGNIFICANT FIGURES
METHOD B
B

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)
BLACK	0	1	± -
BROWN	1	10	± 1
RED	2	100	± 2
ORANGE	3	1,000	± 3
YELLOW	4	10,000	± 4
GREEN	5	100,000	± 5
BLUE	6	1,000,000	± 6
VIOLET	7	10,000,000	± 7
GRAY	8	100,000,000	± 8
WHITE	9	1,000,000,000	± 9
GOLD	–	0.1	± 5
SILVER	–	0.01	± 10
NO COLOR	–	–	± 20

NOTES

* INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A NATURAL TAN BACKGROUND COLOR NON-INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A BLACK BACKGROUND.

† RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.

RMA RADIO MANUFACTURERS ASSOCIATION

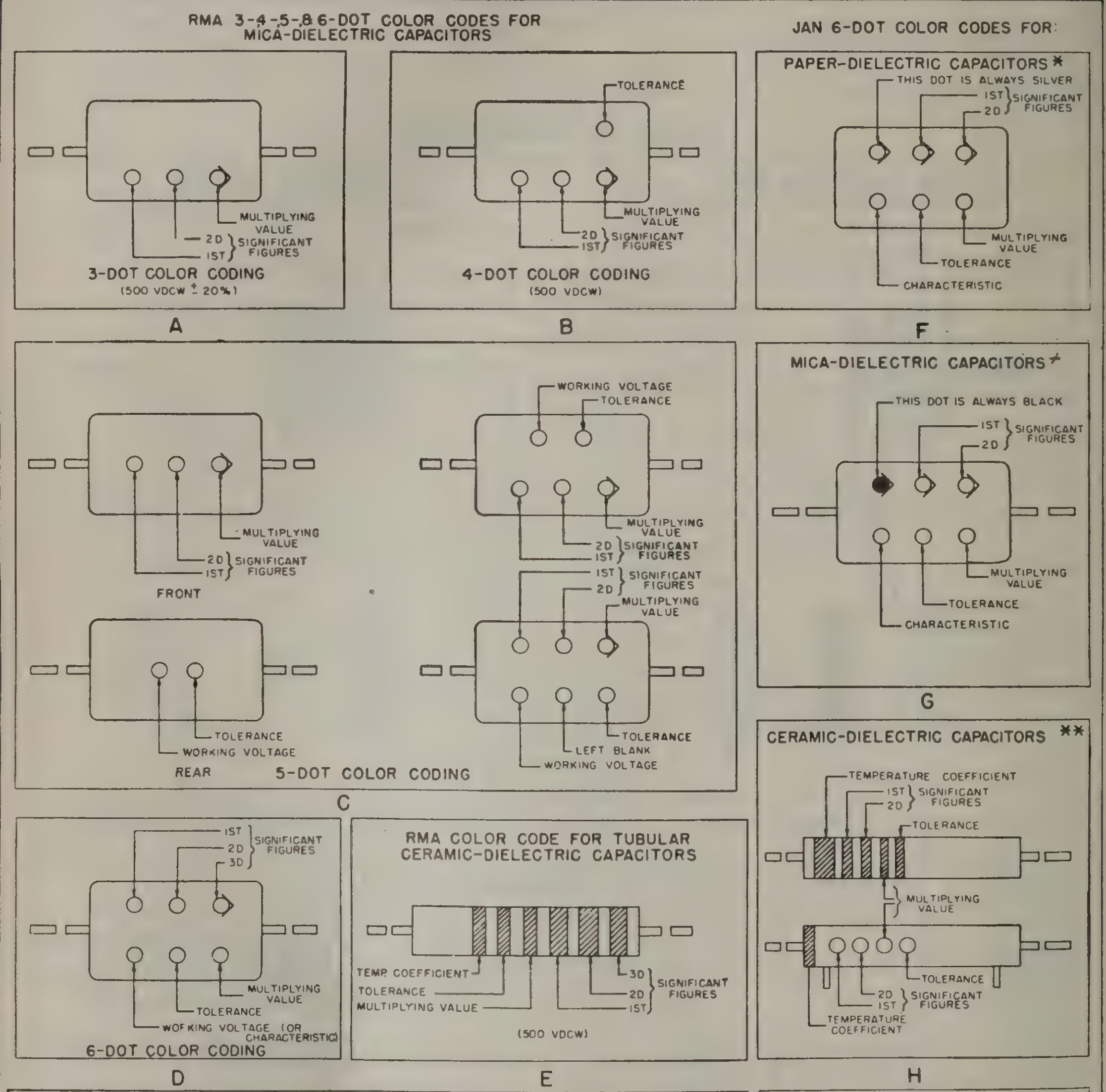
JAN JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS

TL 32454S

Figure 133. Resistor color codes.

CAPACITOR COLOR CODES


RMA 3-4-,5-,& 6-DOT COLOR CODES FOR MICA-DIELECTRIC CAPACITORS
JAN 6-DOT COLOR CODES FOR:
MULTIPLYING VALUE
2D
1ST
SIGNIFICANT FIGURES
3-DOT COLOR CODING
(500 VDCW ± 20%)
A
TOLERANCE
MULTIPLYING VALUE
2D
1ST
SIGNIFICANT FIGURES
4-DOT COLOR CODING
(500 VDCW)
B
PAPER-DIELECTRIC CAPACITORS *
THIS DOT IS ALWAYS SILVER
1ST
2D
SIGNIFICANT FIGURES
MULTIPLYING VALUE
TOLERANCE
CHARACTERISTIC
F
MULTIPLYING VALUE
2D
1ST
SIGNIFICANT FIGURES
FRONT
TOLERANCE
WORKING VOLTAGE
REAR
WORKING VOLTAGE
TOLERANCE
MULTIPLYING VALUE
2D
1ST
SIGNIFICANT FIGURES
1ST
2D
SIGNIFICANT FIGURES
MULTIPLYING VALUE
TOLERANCE
LEFT BLANK
WORKING VOLTAGE
5-DOT COLOR CODING
C
MICA-DIELECTRIC CAPACITORS ✝
THIS DOT IS ALWAYS BLACK
1ST
2D
SIGNIFICANT FIGURES
MULTIPLYING VALUE
TOLERANCE
CHARACTERISTIC
G
1ST
2D
3D
SIGNIFICANT FIGURES
MULTIPLYING VALUE
TOLERANCE
WOFKING VOLTAGE (OR CHARACTERISTIC)
6-DOT COLOR CODING
D
RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS
TEMP. COEFFICIENT
TOLERANCE
MULTIPLYING VALUE
3D
2D
1ST
SIGNIFICANT FIGURES
(500 VDCW)
E
CERAMIC-DIELECTRIC CAPACITORS **
TEMPERATURE COEFFICIENT
1ST
2D
SIGNIFICANT FIGURES
TOLERANCE
MULTIPLYING VALUE
TOLERANCE
2D
1ST
SIGNIFICANT FIGURES
TEMPERATURE COEFFICIENT
H

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	-
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1,000	300
YELLOW	4	10,000	10,000		400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD	-	0.1	0.1		1,000
SILVER	-	0.01	0.01		2,000
NO COLOR	-				500

NOTES

* THE SILVER DOT IDENTIFIES THIS MARKING FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE

✝ THE BLACK DOT IDENTIFIES THIS MARKING FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE

** CAPACITORS MARKED WITH THIS CODE HAVE A VOLTAGE RATING OF 500 VDCW EITHER THE BAND OR DOT CODE MAY BE USED FOR BOTH INSULATED (AXIAL-LEAD) OR UNINSULATED (RADIAL-LEAD) CAPACITORS

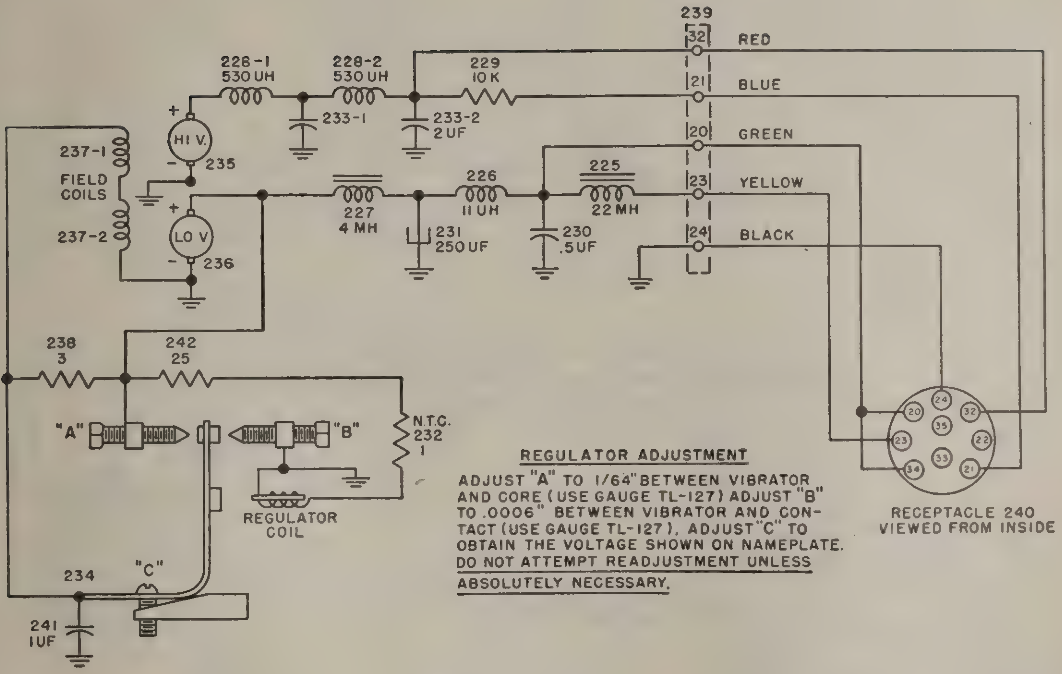
RMA RADIO MANUFACTURERS ASSOCIATION

JAN JOINT ARMY-NAVY

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS

TL 324535

Figure 134. Capacitor color codes.


239
32
RED
21
BLUE
20
GREEN
23
YELLOW
24
BLACK
228-1
530 UH
228-2
530 UH
229
10 K
233-1
233-2
2 UF
237-1
FIELD COILS
237-2
HI V.
235
LO V
236
227
4 MH
226
11 UH
231
250 UF
225
22 MH
230
.5 UF
238
3
242
25
"A"
"B"
N.T.C.
232
1
REGULATOR COIL
234
"C"
241
1 UF
RECEPTACLE 240
VIEWED FROM INSIDE
20
24
32
35
23
22
33
34
21

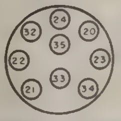
REGULATOR ADJUSTMENT

ADJUST "A" TO 1/64" BETWEEN VIBRATOR AND CORE (USE GAUGE TL-127) ADJUST "B" TO .0006" BETWEEN VIBRATOR AND CONTACT (USE GAUGE TL-127). ADJUST "C" TO OBTAIN THE VOLTAGE SHOWN ON NAMEPLATE. DO NOT ATTEMPT READJUSTMENT UNLESS ABSOLUTELY NECESSARY.

VOLTAGE CHART

TERMINAL	VOLTAGE	CIRCUIT
20	6.3	TRANSMITTER FILAMENTS
21	425	REC. AND TRANS.-105 V.
22	—	
23	6.3	REC. FILAMENT - 1.4 V.
24	NEG.	GROUND
32	425	TRANSMITTER B+
33	—	
34	6.3	KEYING RELAY
35	—	

VOLTAGE CHART MEASUREMENTS MADE WITH NO LOAD.

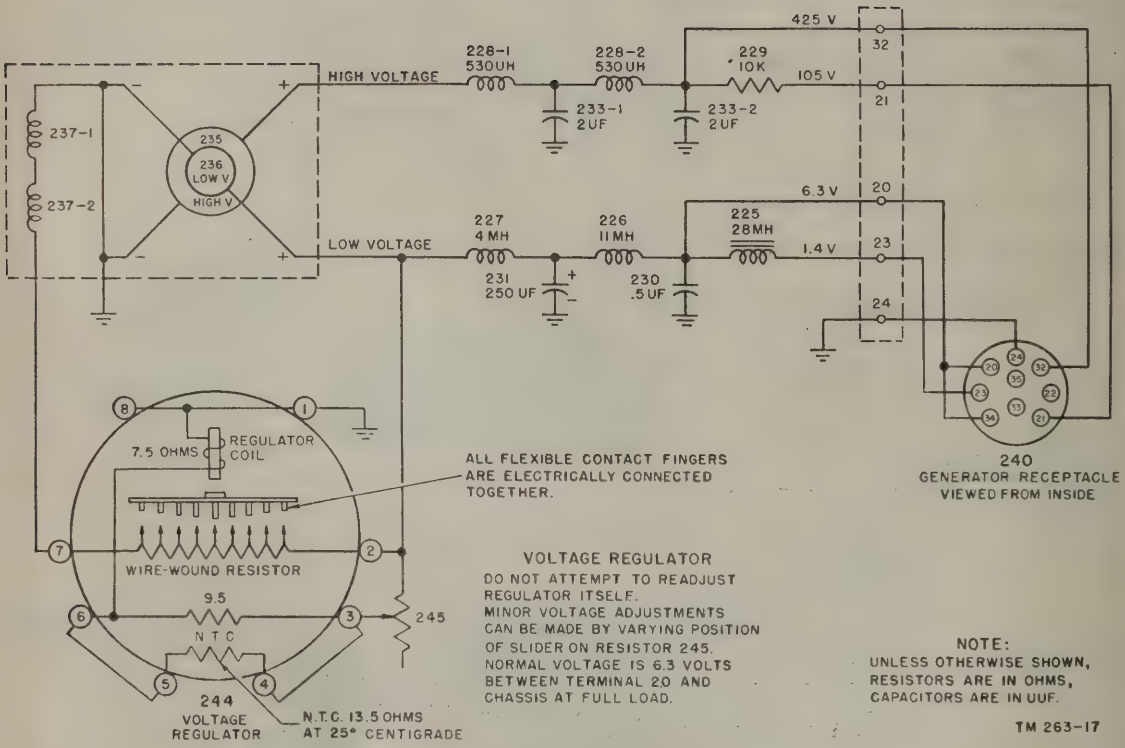

24
32
20
35
22
23
33
21
34

RECEPTACLE 240
IEWED FROM OUTSIDE

NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

TM 263-86

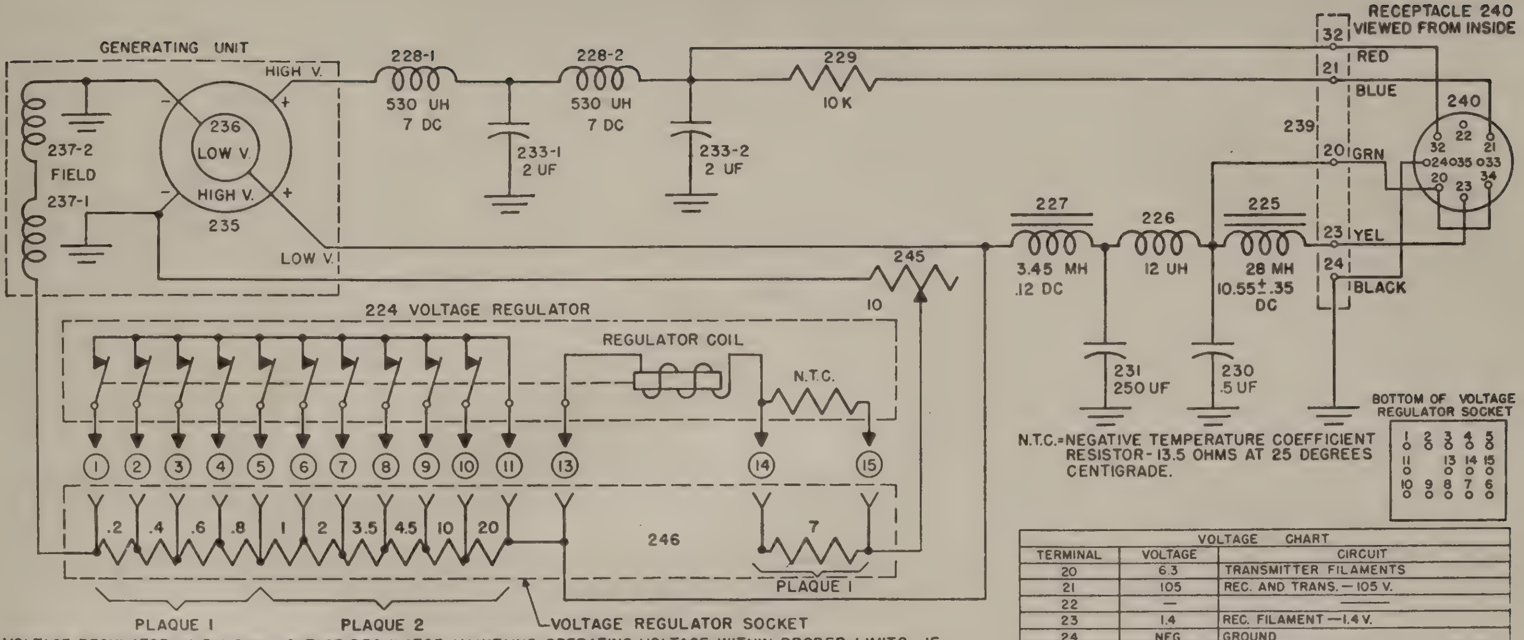
Figure 135. Generator GN–58, schematic diagram.


425 V
32
228-1
530 UH
228-2
530 UH
229
10K
105 V
21
HIGH VOLTAGE
233-1
2 UF
233-2
2 UF
237-1
237-2
235
236
LOW V
HIGH V
6.3 V
20
227
4 MH
226
11 MH
225
28MH
1.4 V
23
LOW VOLTAGE
231
250 UF
230
.5 UF
24
20
24
32
35
23
22
33
34
21
240
GENERATOR RECEPTACLE
VIEWED FROM INSIDE
8
1
7.5 OHMS
REGULATOR
COIL
ALL FLEXIBLE CONTACT FINGERS
ARE ELECTRICALLY CONNECTED
TOGETHER.
7
2
WIRE-WOUND RESISTOR
9.5
6
3
245
N T C
5
4
244
VOLTAGE
REGULATOR
N.T.C. 13.5 OHMS
AT 25° CENTIGRADE
TM 263-17

VOLTAGE REGULATOR
DO NOT ATTEMPT TO READJUST REGULATOR ITSELF.
MINOR VOLTAGE ADJUSTMENTS CAN BE MADE BY VARYING POSITION OF SLIDER ON RESISTOR 245.
NORMAL VOLTAGE IS 6.3 VOLTS BETWEEN TERMINAL 20 AND CHASSIS AT FULL LOAD.

NOTE:
UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 136. Generator GN-58-A (early models), schematic diagram.


RECEPTACLE 240 VIEWED FROM INSIDE
GENERATING UNIT
HIGH V.
LOW V.
236
LOW V.
HIGH V.
235
237-2
FIELD
237-1
228-1
530 UH
7 DC
228-2
530 UH
7 DC
233-1
2 UF
233-2
2 UF
229
10 K
32
21
RED
BLUE
240
22
21
32
24
35
33
20
23
34
239
20
GRN
23
YEL
24
BLACK
227
3.45 MH
.12 DC
226
12 UH
225
28 MH
10.55±.35
DC
231
250 UF
230
.5 UF
245
10
224 VOLTAGE REGULATOR
REGULATOR COIL
N.T.C.
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑬ ⑭ ⑮
.2 .4 .6 .8 1 2 3.5 4.5 10 20
246
7
PLAQUE I
PLAQUE I
PLAQUE 2
VOLTAGE REGULATOR SOCKET
BOTTOM OF VOLTAGE REGULATOR SOCKET
1 2 3 4 5
11 13 14 15
10 9 8 7 6

N.T.C.=NEGATIVE TEMPERATURE COEFFICIENT RESISTOR-13.5 OHMS AT 25 DEGREES CENTIGRADE.

VOLTAGE CHART		
TERMINAL	VOLTAGE	CIRCUIT
20	6.3	TRANSMITTER FILAMENTS
21	105	REC. AND TRANS. — 105 V.
22	—	—
23	1.4	REC. FILAMENT — 1.4 V.
24	NEG	GROUND
32	425	TRANSMITTER B+
33	—	—
34	6.3	KEYING RELAY
35	—	—

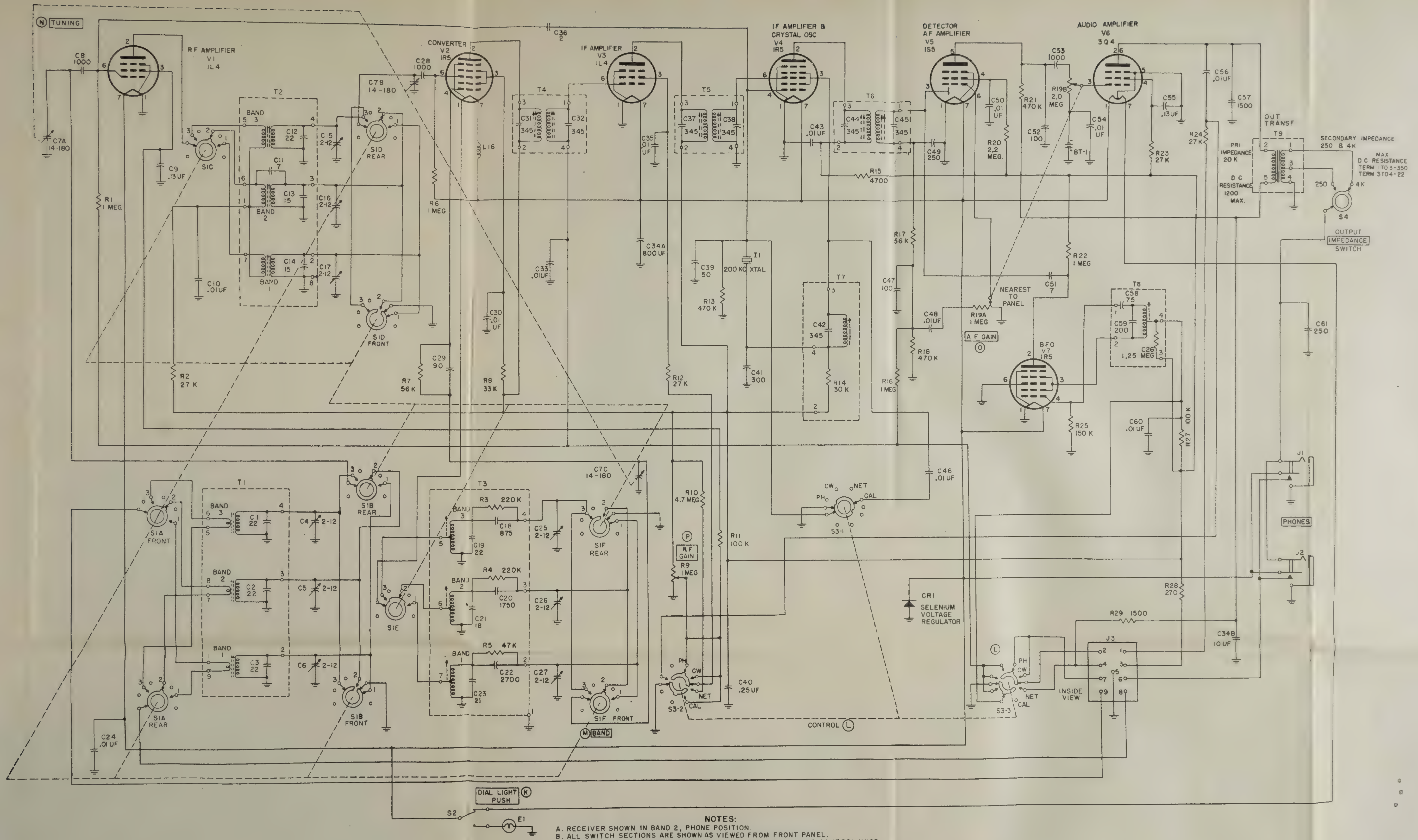
VOLTAGE REGULATOR—A PLUG-IN VOLTAGE REGULATOR MAINTAINS OPERATING VOLTAGE WITHIN PROPER LIMITS. IF REGULATOR IS DEFECTIVE REPLACE WITH NEW PLUG-IN UNIT.
DO NOT ATTEMPT TO READJUST REGULATOR ITSELF—MINOR VOLTAGE ADJUSTMENTS CAN BE MADE BY VARYING POSITION OF SLIDER ON RESISTOR 245. NORMAL VOLTAGE IS 6.3 VOLTS BETWEEN CHASSIS AND TERMINAL 20 ON TERMINAL BOARD AT FULL LOAD.

NOTES:

1. ALL CONTACTS OF REGULATOR ARE NORMALLY CLOSED.
2. ON LATER MODELS, THE MULTI-TAPPED RESISTOR IS CONTAINED IN THE VOLTAGE REGULATOR SOCKET.
3. ON SOME MODELS, CHOKE COIL 227 MAY BE 3.11 MH
4. THE NUMBERS BETWEEN TAPS OF 246 ARE THE RESISTANCES OF THE PORTIONS BETWEEN THE TAPS.
5. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

TM 263-24

Figure 137. Generator GN–58–A (late models) (serial Nos. 10101 through 14464), schematic diagram.


N TUNING
C8 1000
RF AMPLIFIER V1 1L4
C7A 14-180
C9 .13 UF
S1C
R1 1 MEG
T2
BAND 3
C12 22
C11 7
C13 15
BAND 2
C14 15
BAND 1
C10 .01 UF
C15 2-12
C16 2-12
C17 2-12
C7B 14-180
S1D REAR
S1D FRONT
C28 1000
CONVERTER V2 1R5
L16
R6 1 MEG
C36 2
T4
C31 345
C32 345
IF AMPLIFIER V3 1L4
C35 .01 UF
C34A 800 UF
C33 .01 UF
C30 .01 UF
C29 90
R7 56 K
R8 33 K
R2 27 K
IF AMPLIFIER & CRYSTAL OSC V4 1R5
T5
C37 345
C38 345
C39 50
I1 200 KC XTAL
R13 470 K
C41 300
R12 27 K
C43 .01 UF
T6
C44 345
C451 345
R15 4700
T7
C42 345
R14 30 K
DETECTOR AF AMPLIFIER V5 1S5
C49 250
C50 .01 UF
R20 2.2 MEG.
R21 470 K
C52 100
C53 1000
R19B 2.0 MEG
C54 .01 UF
BT-1
AUDIO AMPLIFIER V6 3Q4
C55 .13 UF
C56 .01 UF
C57 1500
R23 27 K
R24 27 K
OUT TRANSF T9
PRI IMPEDANCE 20 K
D C RESISTANCE 1200 MAX.
SECONDARY IMPEDANCE 250 & 4K
MAX D C RESISTANCE TERM 1 TO 3-350 TERM 3 TO 4-22
250
4K
S4
OUTPUT IMPEDANCE SWITCH
R17 56 K
C47 100
R22 1 MEG
C51 7
NEAREST TO PANEL
R19A 1 MEG
A F GAIN
O
C48 .01 UF
R18 470 K
R16 1 MEG
T8
C58 75
C59 200
C26 1.25 MEG
BFO V7 1R5
R25 150 K
C60 .01 UF
R27 100 K
C61 250
C46 .01 UF
CW
NET
PH
CAL
S3-1
J1
PHONES
J2
CR1 SELENIUM VOLTAGE REGULATOR
R28 270
R29 1500
C34B 10 UF
J3
INSIDE VIEW
L
S3-3
R10 4.7 MEG
P
RF GAIN
R9 1 MEG
R11 100 K
C40 .25 UF
S3-2
CONTROL L
C7C 14-180
T3
R3 220 K
C18 875
C19 22
R4 220K
C20 1750
C21 18
R5 47 K
C22 2700
C23 21
C25 2-12
C26 2-12
C27 2-12
S1F REAR
S1F FRONT
S1E
M BAND
T1
C1 22
C2 22
C3 22
C4 2-12
C5 2-12
C6 2-12
S1A FRONT
S1A REAR
S1B REAR
S1B FRONT
C24 .01 UF
DIAL LIGHT PUSH
K
S2
E1

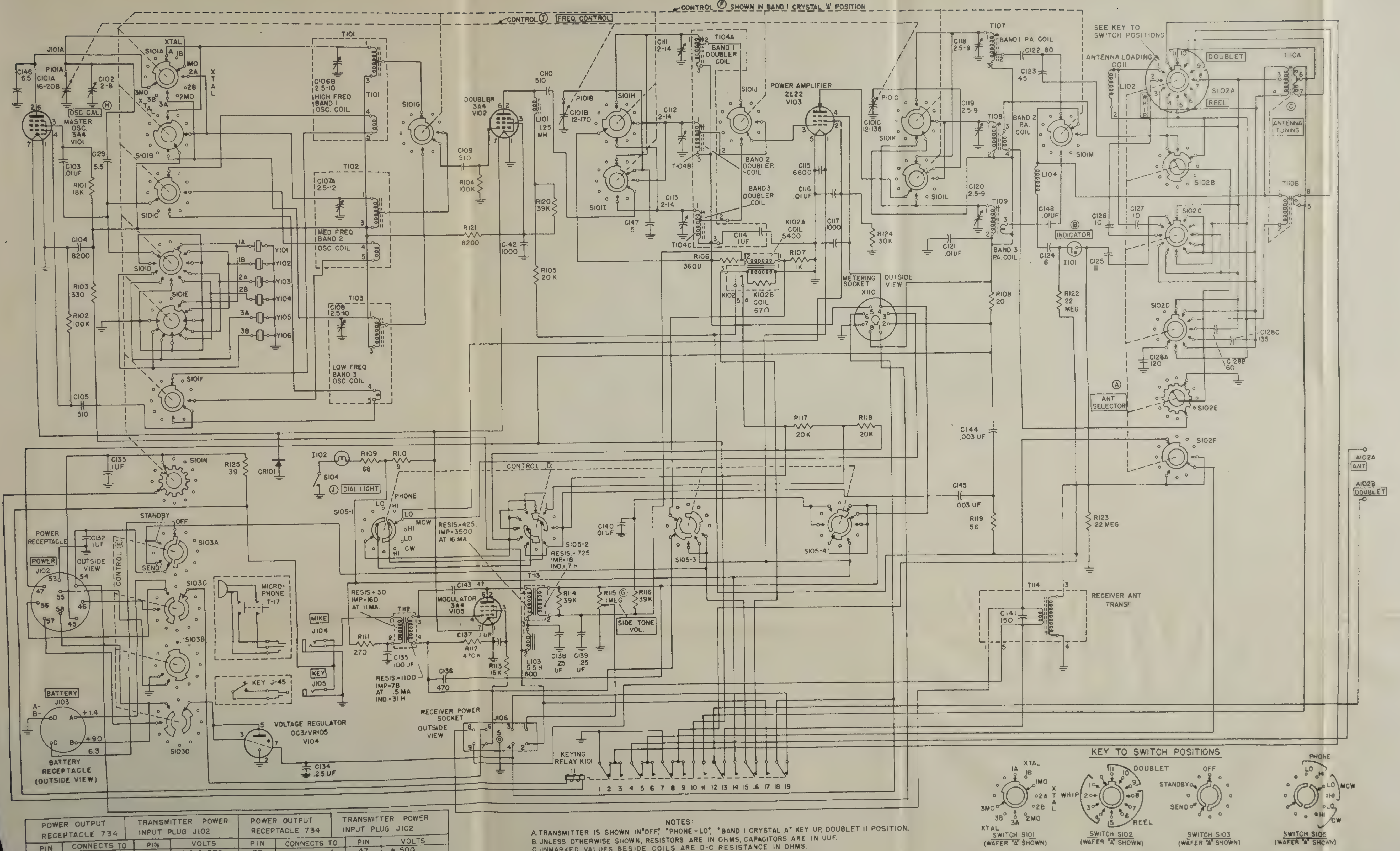
NOTES:

A. RECEIVER SHOWN IN BAND 2, PHONE POSITION.
B. ALL SWITCH SECTIONS ARE SHOWN AS VIEWED FROM FRONT PANEL.
C. FRONT SECTION OF EACH WAFER SECTION IS THE ONE NEAREST CONTROL KNOB.
D. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
E. UNMARKED VALUES BESIDE COILS ARE D-C RESISTANCE IN OHMS.
F. J3 TERMINALS:

1. SIDETONE	6. RECEIVER 1.4 V.
2. NET +105 V	7. AUDIO TUBE POWER CONTROL
3. RECEIVER +105 V	8. RECEIVER ANNTENNA
4. +105 V	9. RECEIVER ANNTENNA
5. GROUND	

Figure 138. Receiver section of receiver-transmitter RT–77/GRC–9, schematic diagram.

Crystal calibrating circuit, receiver	85	73
Crystal calibrator oscillator alinement	169	168


CONTROL Ⓕ SHOWN IN BAND I CRYSTAL 'A' POSITION
CONTROL Ⓘ FREQ CONTROL
MASTER OSC. 3A4 V101
OSC. CAL. Ⓗ
XTAL
DOUBLER 3A4 V102
POWER AMPLIFIER 2E22 V103
T101 HIGH FREQ. BAND I OSC. COIL
T102 MED. FREQ BAND 2 OSC. COIL
T103 LOW FREQ. BAND 3 OSC. COIL
T104A BAND I DOUBLER COIL
BAND 2 DOUBLER COIL
BAND3 DOUBLER COIL
T107 BAND I P.A. COIL
T108 BAND 2 P.A. COIL
T109 BAND 3 P.A. COIL
ANTENNA LOADING COIL
SEE KEY TO SWITCH POSITIONS
DOUBLET
REEL
WHIP
ANTENNA TUNING Ⓒ
INDICATOR Ⓑ
K102A COIL 5400
K102B COIL 67Ω
METERING SOCKET X110 OUTSIDE VIEW
ANT SELECTOR Ⓐ
A102A ANT
A102B DOUBLET
CONTROL Ⓓ
DIAL LIGHT Ⓙ
PHONE
LO HI MCW CW
S105-1 S105-2 S105-3 S105-4
RESIS=425 IMP=3500 AT 16 MA
RESIS=725 IMP=18 IND=.7 H
RESIS=30 IMP=160 AT 11 MA.
RESIS=1100 IMP=78 AT .5 MA IND=.31 H
MODULATOR 3A4 V105
SIDE TONE VOL. Ⓖ
RECEIVER ANT TRANSF T114
POWER RECEPTACLE
POWER J102 OUTSIDE VIEW
CONTROL Ⓔ
STANDBY OFF SEND
MICRO-PHONE T-17
MIKE J104
KEY J105
KEY J-45
BATTERY J103
BATTERY RECEPTACLE (OUTSIDE VIEW)
VOLTAGE REGULATOR OC3/VR105 V104
RECEIVER POWER SOCKET OUTSIDE VIEW J106
KEYING RELAY K101
KEY TO SWITCH POSITIONS
SWITCH S101 (WAFER "A" SHOWN)
SWITCH S102 (WAFER "A" SHOWN)
SWITCH S103 (WAFER "A" SHOWN)
SWITCH S105 (WAFER "A" SHOWN)
TM 263-85

POWER OUTPUT RECEPTACLE 734		TRANSMITTER POWER INPUT PLUG J102		POWER OUTPUT RECEPTACLE 734		TRANSMITTER POWER INPUT PLUG J102	
PIN	CONNECTS TO	PIN	VOLTS	PIN	CONNECTS TO	PIN	VOLTS
20	" "	54	+6.3 REG	32	" "	47	+ 500
21	" "	57	105 SEND	33	" "	58	105 STANDBY
22	" "	56	1.4 STANDBY	34	" "	45	+6.3 KEY
23	" "	46	1.4 SEND	35	" "	55	SEND CONTROL
24	" "	53	A- B-				

NOTES:

A. TRANSMITTER IS SHOWN IN "OFF", "PHONE-LO", "BAND I CRYSTAL A" KEY UP, DOUBLET II POSITION.

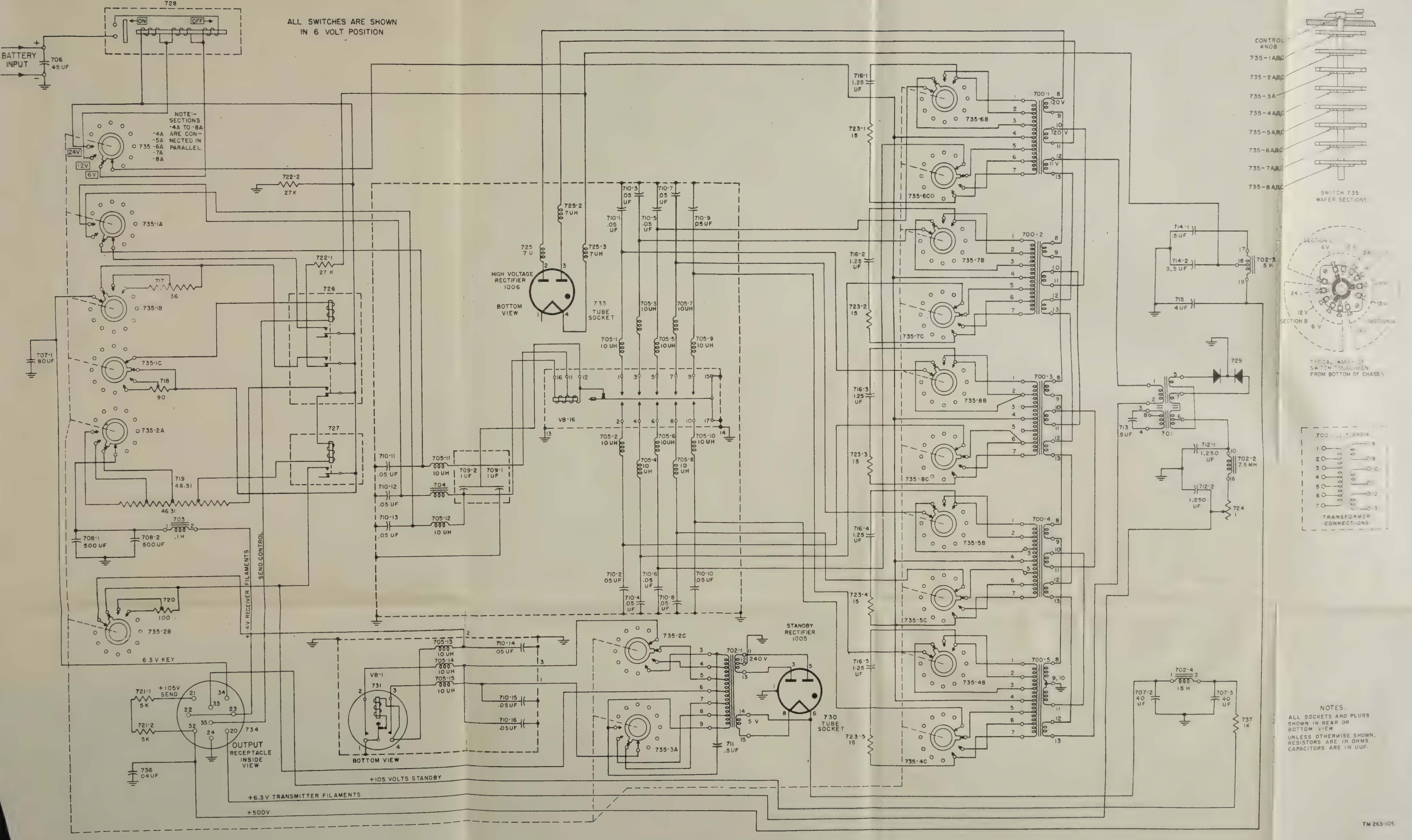
B. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

C. UNMARKED VALUES BESIDE COILS ARE D-C RESISTANCE IN OHMS.

D. J106 TERMINALS:

1. SIDE-TONE SIGNAL	6. RECEIVER 1.4V
2. NET 105V	7. AUDIO TUBE POWER CONTROL
3. RECEIVER 105V	8. RECEIVER ANTENNA
4. 105V	9. RECEIVER ANTENNA
5. GROUND	

Figure 139. Transmitter section of receiver-transmitter RT-77/GRC-9, schematic diagram.


728
ON
OFF
BATTERY INPUT
706 45 UF
ALL SWITCHES ARE SHOWN IN 6 VOLT POSITION
NOTE:- SECTIONS -4A TO -8A ARE CONNECTED IN PARALLEL
735 -4A -5A -6A -7A -8A
24V
12V
6V
722-2 27K
735-1A
722-1 27 K
717 36
735-1B
726
707-1 80UF
735-1C
718 90
735-2A
727
719 46.31
46.31
703 .1H
708-1 500 UF
708-2 500 UF
720 100
735-2B
6.3 V KEY
RECEIVER FILAMENTS
SEND CONTROL
721-1 5K
721-2 5K
+105V SEND
734
OUTPUT RECEPTACLE INSIDE VIEW
736 .04UF
710-11 .05 UF
705-11 10 UH
709-2 1UF
709-1 1UF
710-12 .05 UF
704
710-13 .05 UF
705-12 10 UH
VB-1
731
BOTTOM VIEW
705-13 10 UH
705-14 10 UH
705-15 10 UH
710-14 .05 UF
710-15 .05UF
710-16 .05UF
+105 VOLTS STANDBY
+6.3V TRANSMITTER FILAMENTS
+500V
HIGH VOLTAGE RECTIFIER 1006
BOTTOM VIEW
725 7U
725-2 7UH
725-3 7UH
733 TUBE SOCKET
710-1 .05 UF
710-3 .05 UF
710-5 .05 UF
710-7 .05 UF
710-9 .05 UF
705-1 10 UH
705-3 10UH
705-5 10UH
705-7 10UH
705-9 10 UH
VB-16
705-2 10 UH
705-4 10 UH
705-6 10UH
705-8 10 UH
705-10 10 UH
710-2 .05 UF
710-4 .05 UF
710-6 .05 UF
710-8 .05 UF
710-10 .05 UF
735-2C
735-3A
702-1
240 V
5 V
711 .5UF
STANDBY RECTIFIER 1005
730 TUBE SOCKET
716-1 1.25 UF
723-1 15
735-6B
700-1
120 V
120 V
11 V
735-6C
716-2 1.25 UF
723-2 15
700-2
735-7B
735-7C
716-3 1.25 UF
700-3
735-8B
723-3 15
735-8C
716-4 1.25 UF
700-4
735-5B
723-4 15
735-5C
716-5 1.25 UF
700-5
735-4B
723-5 15
735-4C
714-1 .5 UF
714-2 3.5 UF
715 4 UF
702-3 .5 H
729
713 .5UF
701
712-1 1,250 UF
702-2 7.5 MH
712-2 1,250 UF
724 1
702-4 15 H
707-2 40 UF
707-3 40 UF
737 1K
CONTROL KNOB
735-1ABC
735-2ABC
735-3A
735-4ABC
735-5ABC
735-6ABC
735-7ABC
735-8ABC
SWITCH 735 WAFER SECTIONS
SECTION C
SECTION B
6V
12V
24V
TYPICAL WAFER OF SWITCH 735 SEEN FROM BOTTOM OF CHASSIS
700-1, 2, 3 AND 4
TRANSFORMER CONNECTIONS

NOTES.
ALL SOCKETS AND PLUGS SHOWN IN REAR OR BOTTOM VIEW
UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

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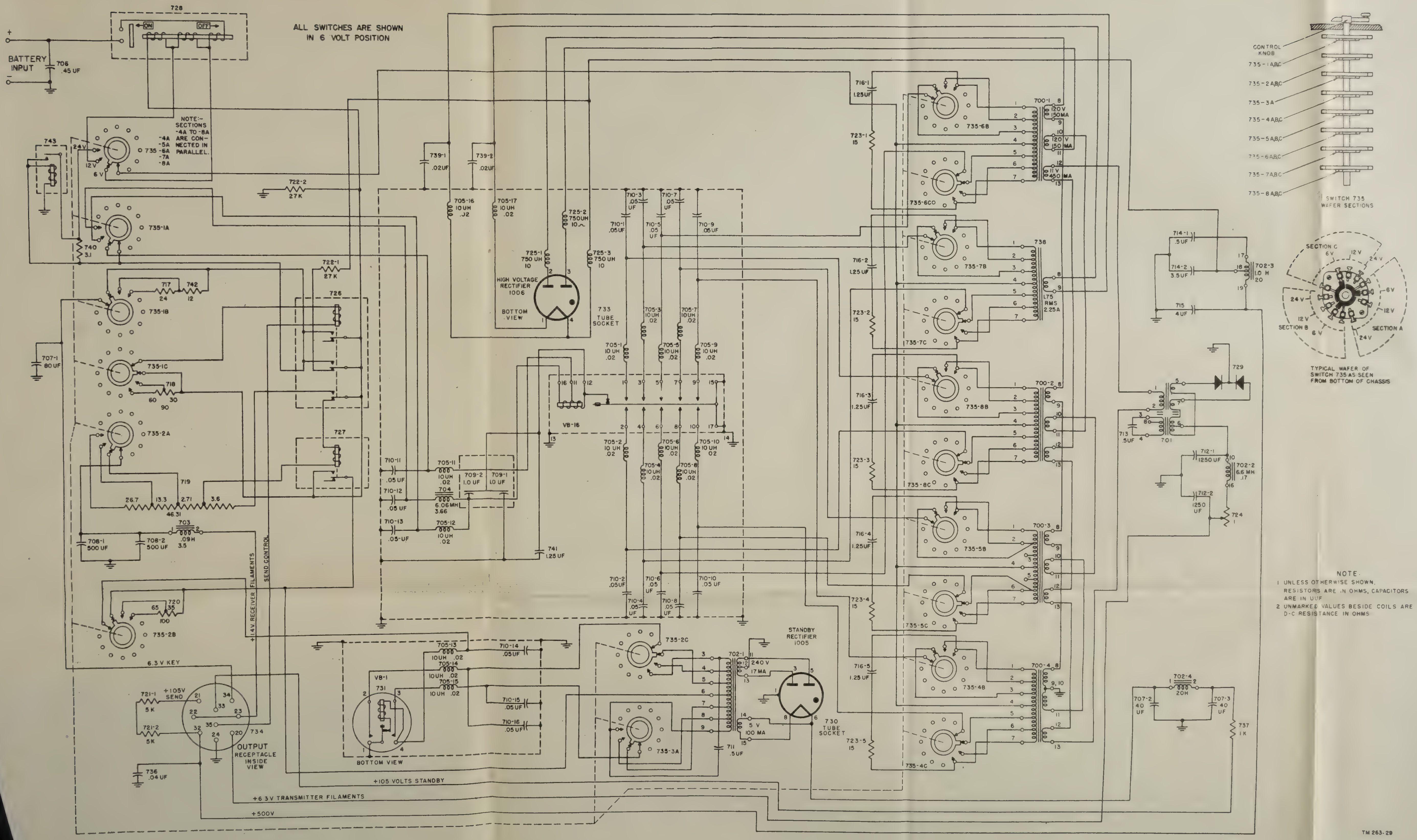
Figure 140. Vibrator power unit PE-237 (early models), schematic diagram.

929610 O - 51 (Face p. 228) No. 3


ALL SWITCHES ARE SHOWN IN 6 VOLT POSITION
BATTERY INPUT
706 .45 UF
728
ON
OFF
NOTE:- SECTIONS -4A TO -8A ARE CONNECTED IN PARALLEL.
735 -4A -5A -6A -7A -8A
743
24 V
12 V
6 V
722-2 27 K
722-1 27 K
739-1 .02UF
739-2 .02UF
735-1A
740 3.1
735-1B
717 24
742 12
735-1C
718 60 30 90
735-2A
719 26.7 13.3 2.71 3.6 46.31
707-1 80 UF
703 .09H 3.5
708-1 500 UF
708-2 500 UF
735-2B
720 65 35 100
6.3 V KEY
726
727
+14 V RECEIVER FILAMENTS
SEND CONTROL
721-1 5K
721-2 5K
+105V SEND
734 OUTPUT RECEPTACLE INSIDE VIEW
736 .04 UF
705-16 10 UH .02
705-17 10 UH .02
725-1 750 UH 10
725-2 750UH 10
725-3 750 UH 10
HIGH VOLTAGE RECTIFIER 1006
BOTTOM VIEW
733 TUBE SOCKET
710-1 .05UF
710-3 .05 UF
710-5 .05 UF
710-7 .05 UF
710-9 .05UF
705-1 10 UH .02
705-3 10UH .02
705-5 10UH .02
705-7 10UH .02
705-9 10 UH .02
VB-16
705-2 10 UH .02
705-4 10UH .02
705-6 10UH .02
705-8 10UH .02
705-10 10 UH .02
710-2 .05UF
710-4 .05 UF
710-6 .05 UF
710-8 .05 UF
710-10 .05 UF
710-11 .05 UF
710-12 .05 UF
710-13 .05 UF
705-11 10 UH .02
704 6.06 MH 3.66
705-12 10 UH .02
709-2 1.0 UF
709-1 1.0 UF
741 1.25 UF
705-13 10UH .02
705-14 10UH .02
705-15 10UH .02
710-14 .05UF
710-15 .05UF
710-16 .05UF
VB-1 731
BOTTOM VIEW
735-2C
735-3A
702-1 240 V 17 MA 5 V 100 MA
STANDBY RECTIFIER 1005
730 TUBE SOCKET
711 .5UF
+105 VOLTS STANDBY
+6.3 V TRANSMITTER FILAMENTS
+500V
716-1 1.25UF
716-2 1.25 UF
716-3 1.25UF
716-4 1.25UF
716-5 1.25 UF
723-1 15
723-2 15
723-3 15
723-4 15
723-5 15
735-6B
735-6C
735-7B
735-7C
735-8B
735-8C
735-5B
735-5C
735-4B
735-4C
700-1 120 V 150MA 120 V 150 MA 11 V 450 MA
738 L75 RMS 2.25A
700-2
700-3
700-4
714-1 .5 UF
714-2 3.5UF
702-3 1.0 H 20
715 4 UF
729
713 .5UF
701
712-1 1250 UF
702-2 6.6 MH .17
712-2 1250 UF
724 1
702-4 20H
707-2 40 UF
707-3 40 UF
737 1 K
CONTROL KNOB
735-1A,B,C
735-2A,B,C
735-3A
735-4A,B,C
735-5A,B,C
735-6A,B,C
735-7A,B,C
735-8A,B,C
SWITCH 735 WAFER SECTIONS
SECTION C
SECTION B
SECTION A
6 V
12 V
24 V
TYPICAL WAFER OF SWITCH 735 AS SEEN FROM BOTTOM OF CHASSIS

NOTE:
1 UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
2 UNMARKED VALUES BESIDE COILS ARE D-C RESISTANCE IN OHMS.

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Figure 141. Vibrator power unit PE-237 (late models, serial Nos. 22436 through 26799), schematic diagram.

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